Draft National Electricity Plan

(Volume II)

Transmission

[In fulfilment of CEA's obligation under section 3(4) of the Electricity Act 2003]

Government of India
Ministry of Power
Central Electricity Authority

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CHAPTER - 1

INTRODUCTION

1.1 NATIONAL ELECTRICITY PLAN

As per Section 3 of the Electricity Act 2003, Central Electricity Authority (CEA) has been entrusted with the responsibility of preparing the National Electricity Plan in accordance with the National Electricity Policy and notify such plan once in five years. The Act provides that the draft of National Electricity Plan has to be published inviting suggestions and objections from licensees, generating companies and the public and CEA has to obtain approval of the Central Government before notifying the National Electricity Plan.

This release titled 'Draft National Electricity Plan (Volume-II) – Transmission', which covers the transmission plan for 13th Plan period (i.e. 2017-18 to 2021-22) and perspective plan for period beyond 2021-22. The Draft document is being circulated for seeking comments of all the stakeholders as per the Act.

1.2 NATIONAL ELECTRICITY PLAN – TRANSMISSION

Transmission planning is a continuous process of identification of transmission system addition requirements, their timing and need. The transmission requirements could arise from

(i) new generation additions in the system,

(ii) increase in demand

(iii) system strengthening that may become necessary to achieve reliability as per the planning criteria under change load generation scenario.

These transmission addition requirements are identified, studied and firmed through the transmission planning process.

1.3 TRANSMISSION SYSTEMS IN INDIA

The transmission systems that are in place in the country consist of Inter-State Transmission System(ISTS) and Intra State Transmission System(Intra-STS).

1.3.1 Inter-State Transmission System (ISTS)

At present majority of ISTS is mainly owned and operated by Power Grid Corporation of India Limited(POWERGRID) which is also Central Transmission Utility(CTU). The Inter-State Transmission System (ISTS) schemes are also be built through competitive bidding and many private sector entities now own and operate the ISTS elements. Already, a number of ISTS schemes owned by the private sector or joint venture(JV) between private sector and POWERGRID are under construction. The ISTS serves the following purpose:

(i) Evacuation of power from inter-state generation stations which have beneficiaries in more than one state.

(ii) Onwards transmission of power for delivery of power from inter-state generation stations up to the delivery point of the state grid.

(iii) Transfer of operational surpluses from surplus state(s) to deficit state(s) or from surplus region(s) to deficit region(s) as need under relevant regulation.

1.3.2 Intra State transmission system (Intra-STS)

Intra-STS within the state are mainly owned and operated by the state transmission utilities of each state. The Intra-STS serves the following purpose:

(i) Evacuation of power from the state's generating (both under state and private sector) stations having beneficiaries in that State.

(ii) Onwards transmission within the State from ISTS boundary up to the various substations of the state grid network.

(iii) Transmission within the state grid for delivery of power to the load centres within the state.

1.4 PROVISIONS OF THE 'NATIONAL ELECTRICITY POLICY'

Some of transmission related provisions of the National Electricity Policy, which have implication with regard to the National Electricity Plan, are:

(i) Adequate and timely investments and also efficient and coordinated action to develop a robust and integrated power system for the country.

(ii) Augmenting transmission capacity keeping in view the massive increase planned in generation and also for development of power market.

(iii) While planning new generation capacities, requirement of associated transmission capacity would need to be worked out simultaneously in order to avoid mismatch between generation capacity and transmission facilities. The policy emphasizes the following to meet the above objective:

- The Central Government would facilitate the continued development of the National Grid for providing adequate infrastructure for inter-state transmission of power and to ensure that underutilized generation capacity is facilitated to generate electricity for its transmission from surplus regions to deficit regions.

- The Central Transmission Utility (CTU) and State Transmission Utility (STU) have the key responsibility of network planning and development based on the National Electricity Plan in coordination with all concerned agencies as provided in the Act. The CTU is responsible for the national and regional transmission system planning and development. The STU is responsible for planning and development of the intra-state transmission system. The CTU would need to coordinate with the STUs for achievement of the shared objective of eliminating transmission constraints in cost effective manner.

- Network expansion should be planned and implemented keeping in view the anticipated transmission needs that would be incident on the system in the open access regime. Prior agreement with the beneficiaries would not be a pre-condition for network expansion. CTU/STU should undertake network expansion after identifying the requirements in consultation with stakeholders and taking up the execution after due regulatory approvals.

- Structured information dissemination and disclosure procedures should be developed by the CTU and STUs to ensure that all stakeholders are aware of the status of generation and transmission projects and plans. These should form a part of the overall planning procedures.

(iv) Open access in transmission has been introduced to promote competition amongst the generating companies who can now sell to different distribution licencees across the country. This should lead to availability of cheaper power. The Act mandates non-discriminatory open access in transmission. When open access to distribution networks is introduced by the respective State Commissions for enabling bulk consumers to buy directly from competing generators, competition in the market would increase the availability of cheaper and reliable power supply. The Regulatory Commissions need to provide facilitative framework for non-discriminatory open access. This requires load dispatch facilities with state-of-the art communication and data acquisition capability on a real time basis. While this is the case currently at the regional load dispatch centres, appropriate State Commissions must ensure that matching facilities with technology upgrades are provided at the State level, where necessary and realized not later than June 2006.

(v) To facilitate orderly growth and development of the power sector and also for secure and reliable operation of the grid, adequate margins in transmission system should be created. The transmission capacity would be planned and built to cater to both the redundancy levels and margins keeping in view international standards and practices. A well planned and strong transmission system will ensure not only optimal utilization of transmission capacities but also of generation facilities and would facilitate achieving ultimate objective of cost effective delivery of power. To facilitate cost effective transmission of power across the region, a national transmission tariff framework needs to be implemented by CERC. The tariff mechanism would be sensitive to distance, direction and related to quantum of flow. As far as possible, consistency needs to be maintained in transmission pricing framework in inter-State and intra-State systems. Further it should be ensured that the present network deficiencies do not result in unreasonable transmission loss compensation requirements.

(vi) The necessary regulatory framework for providing non-discriminatory open access in transmission as mandated in the Electricity Act 2003 is essential for signalling efficient choice in locating generation capacity and for encouraging trading in electricity for optimum utilization of generation resources and consequently for reducing the cost of supply.

(vii) Special mechanisms would be created to encourage private investment in transmission sector so that sufficient investments are made for achieving the objective of demand to be fully met by 2012.

1.5 PROVISIONS OF THE 'TARIFF POLICY'

1.5.1 In compliance with section 3 of the Electricity Act 2003, the Central Government notified the Tariff Policy on 6th January, 2006. Further amendments to the Tariff Policy were notified on 31st March, 2008, 20th

January, 2011 and 8th July, 2011. In exercise of powers conferred under section 3(3) of Electricity Act, 2003, the Central Government notifies the revised Tariff Policy to be effective from 28th January 2016. Some of related provisions of the Tariff Policy, which provide objective in development of transmission systems, are:

1.5.2 Objective (Section 7 of Tariff Policy)

- The tariff policy, insofar as transmission is concerned, seeks to achieve the following objectives:

i. Ensuring optimal development of the transmission network ahead of generation with adequate margin for reliability and to promote efficient utilization of generation and transmission assets in the country;

ii. Attracting the required investments in the transmission sector and providing adequate returns.

1.5.3 Transmission pricing (Section 7.1 of Tariff Policy)

i. A suitable transmission tariff framework for all inter-State transmission, including transmission of electricity across the territory of an intervening State as well as conveyance within the State which is incidental to such interstate transmission, has been implemented with the objective of promoting effective utilization of all assets across the country and accelerated development of new transmission capacities that are required.

ii. The National Electricity Policy mandates that the national tariff framework implemented should be sensitive to distance, direction and related to quantum of power flow. This has been developed by CERC taking into consideration the advice of the CEA. Sharing of transmission charges shall be done in accordance with such tariff mechanism as amended from time to time.

iii. Transmission charges, under this framework, can be determined on MW per circuit kilometer basis, zonal postage stamp basis, or some other pragmatic variant, the ultimate objective being to get the transmission system users to share the total transmission cost in proportion to their respective utilization of the transmission system. The 'utilization' factor should duly capture the advantage of reliability reaped by all. The spread between minimum and maximum transmission rates should be such as not to inhibit planned development/augmentation of the transmission system but should discourage non-optimal transmission investment.

iv. In view of the approach laid down by the NEP, prior agreement with the beneficiaries would not be a precondition for network expansion. CTU/STU should undertake network expansion after identifying the requirements in consonance with the National Electricity Plan and in consultation with stakeholders and taking up the execution after due regulatory approvals. For smooth operation of the grid, efforts should be made to develop transmission system ahead of generation.

v. The Central Commission has specified norms for capital and operating costs and laid down Standards of Performance for inter-State transmission licensees. Tariff determination and adherence to Standards of Performance shall be carried out in accordance with these norms, as amended from time to time.

vi. Investment by transmission developer including CTU/STUs would be invited through competitive bids in accordance with the guidelines issued by the Central Government from time to time.

vii. While all future inter-state transmission projects shall, ordinarily, be developed through competitive bidding process, the Central Government may give exemption from competitive bidding for (a) specific category of projects of strategic importance, technical upgradation etc. or (b) works required to be done to cater to an urgent situation on a case to case basis.

viii. CERC has specified Regulation on framework for the inter-State transmission. A similar approach should be implemented by SERCs for the intra-State transmission, duly considering factors like voltage, distance, direction and quantum of flow.

1.6 PROVISIONS IN CERC REGULATIONS

In accordance with the Act, the central commission has issued regulations which entitle distribution licensees, generators, electricity traders and permitted open access customers to seek access to the inter-state transmission system. As per the present regulations access to the transmission system can be sought on short, medium or long term basis. The Central Transmission Utility (CTU) is the nodal agency for providing medium term (3 months to 3 years) and long term (12 to 25 years) access that are typically required by a generating station or a trader on its behalf. The long term access is to be granted through the transmission planning route. The nodal agency for grant of short term open access (up to three months) is the Regional Load Dispatch Centre. The nodal agency for providing transmission access to the power exchanges is the National Load Dispatch Centre. The MTOA and STOA are to be granted using margins in the system and as such no additional transmission envisaged for this purpose as per the regulation.

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CHAPTER - 2

GROWTH OF TRANSMISSION SYSTEM IN INDIA

2.1 GROWTH OF TRANSMISSION SYSTEMS IN INDIA

2.1.1 Formation of State Grids for integrated planning

At the time of independence, power systems in the country were essentially isolated systems developed in and around urban and industrial areas. The installed generating capacity in the country was only about 1300 MW and the power system consisted of small generating stations feeding power radially to load centres. The highest transmission voltage was 132 kV. The state-sector network grew at voltage level up to 132 kV during the 50s and 60s and then to 220 kV during 60s and 70s. Subsequently, in many states (Utter Pradesh, Maharashtra, Madhya Pradesh, Gujarat, Orissa, Andhra Pradesh and Karnataka) substantial 400kV network was also developed in the State sector as large quantum of power was to be transmitted over long distances. With the development of state grids in most states of the country the stage was set for development of regional grids.

2.1.2 Concept of Regional Planning and Integration of State Grids

During the 3rd Five Year Plan, the concept of Regional planning in Power Sector was introduced. Accordingly, for the purposes of power development planning, the country was demarcated into five power Regions viz. Northern, Western, Southern, Eastern and North-Eastern. In 1964, the Regional Electricity Boards were established in each of the Regions of the country for facilitating integrated operation of State Systems in the Region and encouraging exchange of power among the States. To encourage the States to build infrastructure for exchange of such power, inter-State lines were treated as 'centrally sponsored' and the States were provided interest free loans outside the State Plan. 55 nos. of inter-State lines were constructed under the programme of which 13 lines were connecting States located in different Regions and this created the initial set of inter-Regional links. These lines facilitated exchange of power in radial mode among the various Regions.

2.1.3 Evolution of Regional Grids

Till about 1975 the development of transmission was essentially by the State Electricity Boards/ Electricity Departments in the States and Union Territories.

In 1975, to supplement the efforts of the states in increasing generation capacities, Central Sector generation utilities viz. National Hydroelectric Power Corporation (NHPC) and National Thermal Power Corporation (NTPC) were created. These corporations established large generating station for the benefit of States in a region. These corporations also undertook development of associated transmission lines, for evacuation of power and delivery of power to the beneficiary States transcending state boundaries. This gave a fillip to the formation of Regional Grid Systems and by the end of 1980s, strong regional networks came into existence.

2.1.4 Development of inter-regional links

In 1989, transmission wings of Central generating companies were separated to set up Power Grid Corporation of India (POWERGRID) to give thrust to implementation of transmission system associated with Central generating stations and inter-Regional transmission programme based on perspective planning done by CEA. Till then, the generation and transmission systems in the country were planned and developed on the basis of regional self-sufficiency and the initial set of inter-regional links developed under the Centrally sponsored programme for building inter-state infrastructure of State utilities, was utilized to facilitate exchange of operational surpluses among the various Regions in a limited manner because the Regional Grids operated independently and had different operating frequencies and the power exchanges on these inter-regional links could take place only in radial mode.

2.2 DEVELOPMENT OF NATIONAL GRID

The National Grid consists of the transmission system for evacuation of power from generating stations, the inter-regional links, Inter State transmission system and Intra-State transmission of the STUs. Thus, development of national grid has been an evolutionary process**.** The National Grid is a large, meshed synchronous transmission grid where all the regional and State grids in them would be electrically connected and operating at single frequency.

2.2.1 Asynchronous Interconnections between Regional Grids

Considering the operational regime of the various Regional Grids, it was decided around 1990s to establish initially asynchronous connection between the Regional Grids to enable them to exchange large regulated quantum of power. Accordingly, a 500 MW asynchronous HVDC back-to-back link between the Northern Region and the Western Region at Vindhyachal was established.

Subsequently, similar links between Western Region and Southern Region (1000 MW capacity at Bhadrawati) and between Eastern Region and Southern Region (500 MW capacity at Gazuwaka) and between Eastern Region and Northern Region (500 MW capacity at Sasaram), were established. The capacity of Gazuwaka link between Eastern Region and Southern Region has been increased to 1000 MW.

2.2.2 Synchronization of Regional Grids

In 1992 the Eastern Region and the North-Eastern Region were synchronously interconnected through the Birpara-Salakati 220kV double circuit transmission line and subsequently by the 400 kV D/C Bongaigaon -Malda line. Western Region was interconnected to ER-NER system synchronously through 400kV Rourkela-Raipur D/C line in 2003 and thus the Central India system consisting of ER-NER-WR came in to operation. In 2006 with commissioning of Muzaffarpur-Gorakhpur 400kV D/C line, the Northern Region also got interconnected to this system making an upper India system having the NR-WR-ER-NER system. In 2007 NR was also synchronously interconnected with WR through Agra-Gwalior 765kV S/C line-1 operated at 400kV level. The southern grid was also synchronously connected with rest of all-India grid in December, 2014 through Raichur-Solapur 765 kV line. It thus now, the National grid is comprised of five regions, connected in synchronous mode and is operating at single frequency.

2.2.3 All India Planning and Evolution of Integrated National Grid

Since the advent of the current century, the focus of planning the generation and the transmission system in the country has shifted from the orientation of regional self-sufficiency to the concept of optimization of utilization of resources on all-India basis. Generation planning studies carried out by CEA had indicated that the capacity addition planned on all-India basis is less than that planned on regional basis. Further, a strong all-India integrated national grid enables harnessing of unevenly distributed generation resources in the country. Recognizing the need for development of National grid, thrust was given to enhance the capacity of inter-regional links in a phased manner. Total inter-regional transmission capacity by the end of 9th Plan was 5750 MW. During 10th Plan i.e. 2002-07, a total of 8300 MW of inter-regional capacities were added. In this effort, major achievements were - addition of Talcher-Kolar HVDC Bipole, second module of HVDC back-to-back system between SR and ER at Gazuwaka, HVDC back-to-back system between NR and ER at Sasaram, synchronous inter-connection of NER/ER grid with WR grid by Rourkela-Raipur

400kV D/C line, synchronous inter-connection of NER/ER/WR grid with NR grid by Muzaffarpur-Gorakhpur 400kV D/C (quad) line and subsequently, one circuit of Patna-Balia 400kV D/C (quad) line and Agra-Gwalior 765kV transmission line. Total inter-regional transmission capacity by the end of 10th Plan was 14050 MW and increased to 27750 MW by the end of 11th Plan. This capacity is likely to increase to 72350 MW by the end of 12th Plan.(i. e March 2017). Details of inter-regional links that are expected to be implemented during 12th Plan period are given in Chapter-6, and those under-construction/ planned for 13th Plan period are given in Chapter-7.

2.3 GROWTH OF TRANSMISSION SYSTEM IN PHYSICAL TERMS

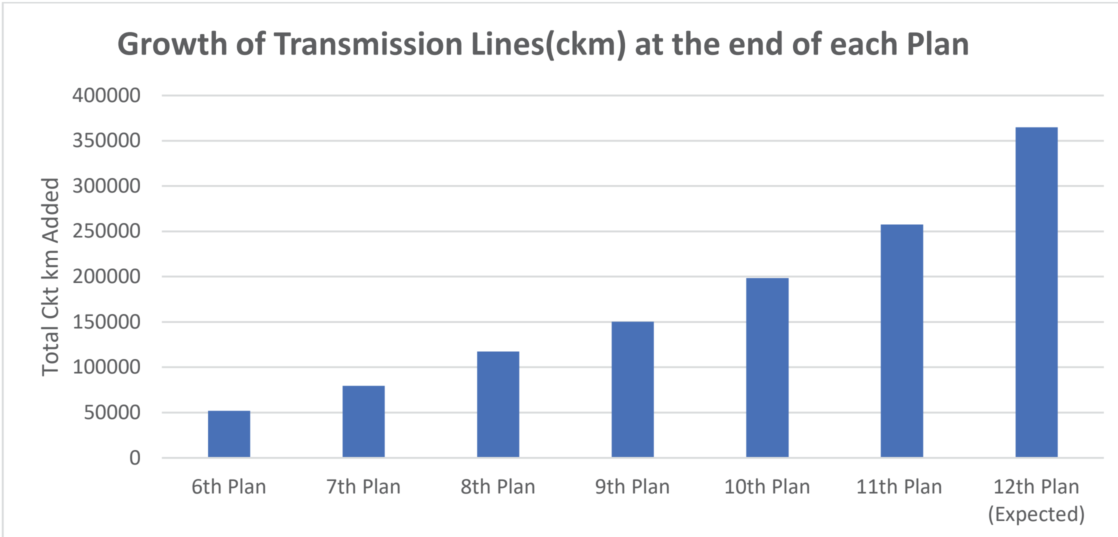
There has been a consistent increase in the transmission network and transformation capacity in India. This increase is in consonance with increase in generation and demand of electricity in the country. The increase in the transmission lines of 220kV and above voltage levels, in terms of circuit kilometres, have been roughly 7 times in last 30 years and that for substation capacity more than 15 times in the same period. There has been more increase in the transmission system at higher voltage levels and substation capacities. This aspect of growth in transmission highlights requirements of transmission network to carry bulk power over longer distances and at the same time optimize right of way, minimize losses and improve grid reliability.

2.3.1 Growth in transmission lines

Cumulative growth in transmission lines, of 220kV and above voltage levels, since end of 6th five-year plan(i.e. March 1985) to (i.e. March 2017) is depicted below:

Growth of Transmission Lines at the end of each Plan (All figs in Ckm):

Voltage level	6th Plan	7th Plan	8th Plan	9th Plan	10th Plan	11th Plan	12th Plan (Expected)
765kV	0	0	0	971	2184	5250	29431
HVDC Bipole	0	0	1634	3138	5872	9432	15535
400kV	6029	19824	36142	49378	75722	106819	157644
220kV	46005	59631	79600	96993	114629	135980	162325
Total ckm	**52034**	**79455**	**117376**	**150480**	**198407**	**257481**	**364935**

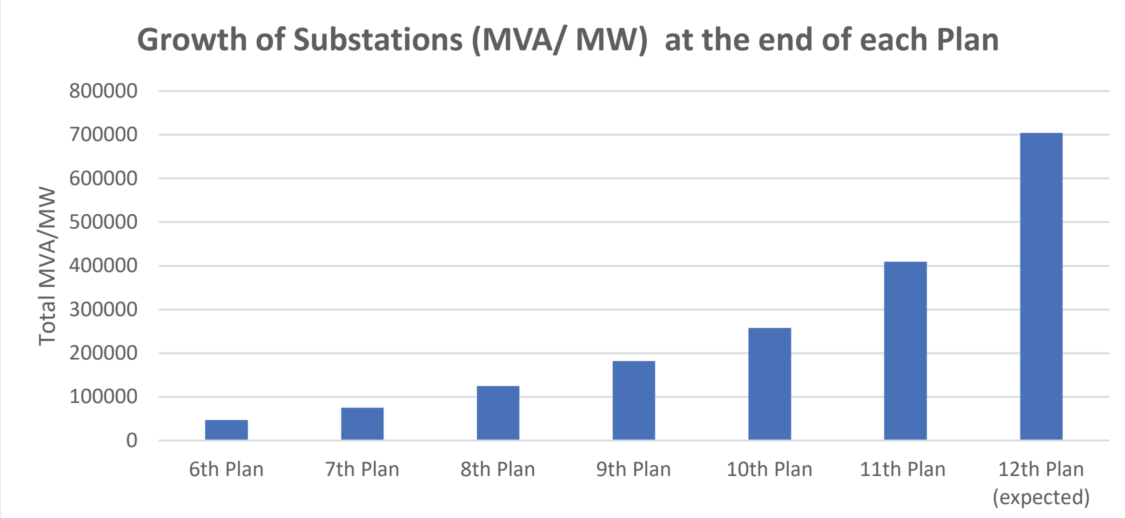


2.3.2 Growth of Substations

Cumulative growth in transformation capacity of substations and HVDC terminals, of 220kV and above voltage levels, since end of 6th five-year plan(i.e. March 1985) to (i.e. March 2017) is depicted below:

Growth of Substations (MVA/ MW) at the end of each Plan:

	6th Plan	7th Plan	8th Plan	9th Plan	10th Plan	11th Plan	12th Plan (expected)
765kV	0	0	0	0	0	25000	155000
HVDC Bipole	0	0	0	5000	8000	9750	16500
400kV	9330	21580	40865	60380	92942	151027	234372
220kV	37291	53742	84177	116363	156497	223774	298265
Total MVA/MW	**46621**	**75322**	**125042**	**181743**	**257439**	**409551**	**704137**



2.4 LANDMARK EVENTS FOR TRANSMISSION SECTOR

Development of the transmission network has been done in tandem with growth in generation capacity. The growth in transmission system is characterized by the physical growth in transmission network as well as introduction of higher transmission voltages and new technologies for bulk power transmission. Landmark events of this growth are:

1948	Electricity (Supply) Act 1948. The Act provided for establishment of the Central Electricity Authority (CEA) and the State Electricity Boards
1950-60	Growth of State Grids and introduction of 220kV voltage level
1964	Constitution of Regional Electricity Boards
1965-73	Interconnecting State Grids to form Regional Grid systems
1977	Introduction of 400kV voltage level
1980-88	Growth of Regional Grid Systems as associated transmission system with Central Sector generation
1989	HVDC back-to-back System
1990	Introduction of HVDC bi-pole line
1992	Synchronous inter-connection of ER and NER
1999	Transmission planning re-oriented towards all-India system

2000	Introduction of 765kV transmission line (initially charged at 400kV)
2003	- Electricity Act 2003 - ABT with real time settlement mechanism implemented in all the five electrical regions creating the basic infrastructure for the operation of an electricity market. - Synchronous inter-connection of WR with ER-NER system - Bulk inter-regional HVDC transmission system (Talcher – Kolar HVDC link)
2004	Open access in transmission
2006	Synchronous inter-connection of NR with ER-NER-WR system
2007	765kV operation of Sipat Substation
2007	765kV operation of 765kV transmission lines
2010	Notification of POSOCO – for operation of RLDCs/NLDC as a separate organization from CTU
2011	Implementation of point-of-connection based method for sharing transmission charges and losses all across the country.
2014	Synchronous inter-connection of SR and NEW Grid
2016-17	Interconnection between India and Bangladesh (500 MW asynchronous HVDC back-to-back link at Bheramara, Bangladesh and 400 kV D/c transmission line between at Baharampur in India and Bheramara in Bangladesh.)
2016-17	Interconnection between India and Mynmaar
2016-17	NER directly connected with NR. The longest 6000 MW HVDC line (±)800kV) from Bishwanath Chariali in NER to Agra in NR for dispersal of power from NER to NR/WR
2016-17	Increase in the transmission lines 107454 in terms of circuit kilometres (220kV and above voltage levels), and that for substation capacity 287836 in terms of MVA. Highest ever capacity addition.

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CHAPTER - 3

TRANSMISSION PLANNING PHILOSOPHY AND DEVELOPMENT PROCESS

3.1 TRANSMISSION PLANNING PHILOSOPHY

3.1.1 Transmission planning philosophy in India has evolved over last few decades keeping pace with developments and needs of the electricity sector. The transmission planning has been aligned with the Electricity Act 2003, National electricity policy, tariff policy, regulations and market orientation of the electricity sector. The objectives, approach and criteria for transmission planning, which evolved in time, take care of uncertainties in load growth and generation capacity addition while optimizing investment in transmission on long term basis. These objectives, approach and criteria are kept in view while planning transmission addition requirements to meet targets for adequacy, security and reliability. Transmission plan is firmed up through system studies/analysis considering various technological options and the transmission planning philosophy. The Transmission system in India is planned considering the planning philosophy and guidelines given in " Manual on Transmission Planning Criteria" January, 2013 of Central Electricity Authority.

3.2 TRANSMISSION DEVELOPMENT PROCESS

3.2.1 Coordinated planning and Standing Committees for Power System Planning (SCPSP)

Optimum development of transmission system growth plan requires coordinated planning of the inter State and intra-State grid systems. In respect of development of ISTS, the focus mainly is the interface of ISTS and State grid at drawal point of the State and the ability of ISTS to deliver this power and provide additional reliability to the State grid. In respect of development of Intra-STS, the focus is to enhance ability of State grid to transmit power drawn from ISTS and its own generating stations up to its load centres. The process of integrated planning is being coordinated by the Central Electricity Authority as part of its functions and duties under Section 73(a) of the Electricity act 2003.

To fulfil this objective and carry out integrated planning through coordination and consultation with transmission utilities and other stake-holders, CEA has constituted Regional Standing Committees for Power System Planning(SCPSP) to firm up transmission addition proposals. These Standing Committees for Power System Planning have representation of CEA, CTU, STUs of the constituent States, Regional Power Committee (RPC) of the concerned region and representatives of Central Sector Generating Companies in the region. The inter-state transmission system developed either for evacuation of the generation or for system improvement is discussed in the SCPSP of respective region(s). Transmission addition requirements arising out of Long Term Access (LTA) applications are also discussed and firmed up by the SCPSP in the presence of the applicants. Combined meeting of all the regions is held to discuss common issues.

3.2.2 Formulation of transmission schemes

Planning of the transmission system for a particular timeframe takes into account the plans formulated by CEA and the generation projects being taken up for execution in that timeframe. The transmission system requirement covers the power evacuation system from the generation projects and system strengthening of the network for meeting the load growth in that time frame. The transmission system is evolved keeping in view the overall optimization on a National level. In this process the total investment in transmission including the inter-state as well as intra-state system is optimized. Based on the perspective plan developed by CEA and depending upon as to which generations are likely to be available during the next 2-3 years and taking into account the load growth in particular areas, CTU or STUs have to prioritize, review (if required) and take up their transmission system expansion programme for implementation.

3.2.3 Implementation of transmission schemes (ISTS)

In respect of ISTS, after firming up of the transmission proposals in the SCPSP and considering schedule of commissioning of associated generating station, CTU and CEA take up the proposal to the Empowered Committee for consideration of its implementation. As recommended by the Empowered committee and after consideration by the Government of India, the transmission schemes are implemented either through the tariff based competitive bidding (TBCB) process or under cost-plus mechanism with regulated tariff Mechanism (RTM) by POWERGRID as the CTU in accordance with provisions of the Tariff Policy.

3.2.4 Intra state transmission system planning and development

The intra-state transmission system (Intra-STS) is to be developed by the State utilities. Their network planning, scheme formulation and the programme of intra-state transmission development have to take into account the transmission system requirements for evacuation of power from state sector and private sector generation projects for intra-state benefit, absorption of power made available through ISTS, meeting the load growth in different areas of the State and improve the reliability of their system. For a coordinated development process aiming at perspective optimization in meeting the growth targets, it would be appropriate that the State Transmission Utilities prepare their State

Electricity Plans taking advantage of development plans for regional grid system and focusing on the specific requirements of the concerned State.

3.3 TRANSMISSION PLANNING CRITERIA

Manual on transmission planning criteria was first brought out by CEA in 1985 setting the planning philosophy of regional self sufficiency. The manual was revised in 1994 taking into account the experience gained on EHV systems. Technological advancements and institutional changes during last ten years have necessitated review of Transmission Planning Criteria. The regional electrical grids of Northern, Western, Eastern and North-Eastern regions have been synchronously interconnected to form one of the largest electrical grids in the world. The country has moved from the concept of regional self-sufficiency to bulk inter-regional transfer of power through high capacity AC and HVDC corridors forming an all-India National Grid.

The Electricity Act, 2003 has brought profound changes in electricity supply industry of India leading to unbundling of vertically integrated State Electricity Boards, implementation of Open Access in power transmission and liberalisation of generation sector. The phenomenal growth of private sector generation and the creation of open market for electricity have brought its own uncertainties. Large numbers of generation projects are coming up with no knowledge of firm beneficiaries. The situation is compounded by uncertainty in generation capacity addition, commissioning schedules and fuel availability. All these factors have made transmission planning a challenging task. Adequate flexibility may be built in the transmission system plan to cater to such uncertainties, to the extent possible. However, given the uncertainties, the possibility of stranded assets or congestion cannot be entirely ruled out.

In the creation of very large interconnected grid, there can be unpredictable power flows leading to overloading of transmission lines due to imbalance in load-generation balance in different pockets of the grid in real time operation. Reliable transmission planning is basically a trade-off between the cost and the risk involved. There are no widely adopted uniform guidelines which determine the criteria for transmission planning vis-à-vis acceptable degree of adequacy and security. Practices in this regard vary from country to country. The common theme in the various approaches is "acceptable system performance".

However, the grid incidents of July 2012 have underlined the importance of grid security. As the grid grows in size and complexity, grid security has to be enhanced because the consequences of failure of a large grid are severe. The transmission planning criteria has been reviewed accordingly. The transmission planning criteria has also considered large scale integration of renewable energy sources.

3.3.1 Scope

(i) The Central Electricity Authority is responsible for preparation of perspective generation and transmission plans and for coordinating the activities of planning agencies as provided under Section 73(a) of the Electricity Act 2003. The Central Transmission Utility (CTU) is responsible for development of an efficient and coordinated inter-state transmission system (ISTS). Similarly, the State Transmission Utility (STU) is responsible for development of an efficient and coordinated intra-state transmission system (Intra-STS). The ISTS and Intra-STS are interconnected and together constitute the electricity grid. It is therefore imperative that there should be a uniform approach to transmission planning for developing a reliable transmission system.

(ii) The planning criteria detailed herein are primarily meant for planning of Inter-State Transmission System (ISTS) down to 132kV level and Intra-State Transmission System (Intra-STS) down to 66kV level, including the dedicated transmission lines.

(iii) The manual covers the planning philosophy, the information required from various entities, permissible limits, reliability criteria, broad scope of system studies, modeling and analysis, and gives guidelines for transmission planning.

3.3.2 Applicability

(i) These planning criteria shall be applicable from the date it is issued by Central Electricity Authority i.e. 1st February 2013.

(ii) These criteria shall be used for all new transmission systems planned after the above date.

(iii) The existing and already planned transmission systems may be reviewed with respect to the provisions of these planning criteria. Wherever required and possible, additional system may be planned to strengthen the system. Till implementation of the additional system, suitable defense mechanisms may have to be put into place.

3.3.3 Planning philosophy and general guidelines

(i) The transmission system forms a vital link in the electricity supply chain. Transmission system provides ‘service’ of inter-connection between the source (generator) and consumption (load centers) of electricity. In the

Indian context, the transmission system has been broadly categorised as Inter-State Transmission System(ISTS) and Intra-State Transmission system(Intra-STS). The ISTS is the top layer of national grid below which lies the Intra-STS. The smooth operation of power system gets adversely affected on account of any of these systems. Therefore, the criteria prescribed here are intended to be followed for planning of both ISTS and Intra-STS.

(ii) The transmission system is generally augmented to cater to the long term requirements posed by eligible entities, for example, for increase in power demand, generation capacity addition etc. Further, system may also be augmented considering the feedback regarding operational constraints and feedback from drawing entities.

(iii) The long term applicants seeking transmission service are expected to pose their end-to-end requirements well in advance to the CTU/STUs so as to make-available the requisite transmission capacity, and minimise situations of congestion and stranded assets.

(iv) The transmission customers as well as utilities shall give their transmission requirement well in advance considering time required for implementation of the transmission assets. The transmission customers are also required to provide a reasonable basis for their transmission requirement such as - size and completion schedule of their generation facility, demand based on EPS and their commitment to bear transmission service charges.

(v) Planning of transmission system for evacuation of power from hydro projects shall be done river basin wise considering the identified generation projects and their power potential.

(vi) In case of highly constrained areas like congested urban / semi-urban area, very difficult terrain etc., the transmission corridor may be planned by taking long term perspective of optimizing the right-of-way and cost. This may be done by adopting higher voltage levels for final system and operating one level below in the initial stage, or by using multi-circuit towers for stringing circuits in the future, or using new technology such as HVDC, GIS etc.

(vii) In line with Section 39 of the Electricity Act, the STU shall act as the nodal agency for Intra-STS planning in coordination with distribution licensees and intra-state generators connected/to be connected in the STU grid. The STU shall be the single point contact for the purpose of ISTS planning and shall be responsible on behalf of all the intra-State entities, for evacuation of power from their State's generating stations, meeting requirements of DISCOMS and drawing power from ISTS commensurate with the ISTS plan.

(viii) Normally, the various intra-State entities shall be supplied power through the intra-state network. Only under exceptional circumstances, the load serving intra-State entity may be allowed direct inter-connection with ISTS on recommendation of STU provided that such an entity would continue as intra-State entity for the purpose of all jurisdictional matters including energy accounting. Under such situation, this direct interconnection may also be used by other intra-State entity(s).

(ix) Further, State Transmission Utilities (STUs) shall coordinate with urban planning agencies, Special Economic Zone (SEZ) developers, industrial developers etc. to keep adequate provision for transmission corridor and land for new substations for their long term requirements.

(x) The system parameters and loading of system elements shall remain within prescribed limits. The adequacy of the transmission system should be tested for different feasible load-generation scenarios as prescribed in the Planning criteria Manual.

(xi) The system shall be planned to operate within permissible limits both under normal as well as after more probable credible contingency(ies) as detailed in subsequent paragraphs of this manual. However, the system may experience extreme contingencies which are rare, and the system may not be planned for such rare contingencies. To ensure security of the grid, the extreme/rare but credible contingencies should be identified from time to time and suitable defense mechanism, such as - load shedding, generation rescheduling, islanding, system protection schemes, etc. may be worked out to mitigate their adverse impact.

(xii) The following options may be considered for strengthening of the transmission network. The choice shall be based on cost, reliability, right-of-way requirements, transmission losses, down time (in case of up-gradation and re-conductoring options) etc.

- Addition of new transmission lines/ substations to avoid overloading of existing system including adoption of next higher voltage.
- Application of Series Capacitors, FACTS devices and phase-shifting transformers in existing and new transmission systems to increase power transfer capability.

- Up-gradation of the existing AC transmission lines to higher voltage using same right-of-way.
- Re-conductoring of the existing AC transmission line with higher ampacity conductors.
- Use of multi-voltage level and multi-circuit transmission lines.
- Use of narrow base towers and pole type towers in semi-urban / urban areas keeping in view cost and right-of-way optimization.
- Use of HVDC transmission – both conventional as well as voltage source convertor (VSC) based.
- Use of GIS / Hybrid switchgear (for urban, coastal, polluted areas etc)

(xiii) Critical loads such as - railways, metro rail, airports, refineries, underground mines, steel plants, smelter plants, etc. shall plan their interconnection with the grid, with 100% redundancy and as far as possible from two different sources of supply, in coordination with the concerned STU.

(xiv) The planned transmission capacity would be finite and there are bound to be congestions if large quantum of electricity is sought to be transmitted in direction not previously planned.

(xv) Appropriate communication system for the new sub-stations and generating stations may be planned by CTU/STUs and implemented by CTU/STUs/generation developers so that the same is ready at the time of commissioning.

3.3.4 Criteria for steady-state and transient-state behaviour

(i) **General Principles:** The system shall be planned to operate within permissible limits both under normal as well as after more probable credible contingency(ies) (N-0, N-1, N-1-1). To ensure security of the grid, the extreme/rare but credible contingencies should be identified from time to time and suitable defense mechanism, such as - load shedding, generation rescheduling, islanding, system protection schemes, etc. may be worked out to mitigate their adverse impact.

(ii) **Permissible normal and emergency limits:** Normal thermal ratings and normal voltage ratings voltage limits represent equipment limits that can be sustained on continuous basis and Emergency thermal ratings and emergency voltage limits represent equipment limits that can be tolerated for a relatively short time(one hour to two hour depending on design of the equipment). The normal and emergency ratings to be used in this context are given below:

a) Thermal limits: The loading limit for a transmission line shall be its thermal loading limit. The thermal loading limit of a line is determined by design parameters based on ambient temperature, maximum permissible conductor temperature, wind speed, solar radiation, absorption coefficient, emissivity coefficient etc. The maximum permissible thermal line loadings for different types of line configurations, employing various types of conductors, are given in Manual on transmission planning criteria.

- Design of transmission lines with various types of conductors should be based on conductor temperature limit, right-of-way optimization, losses in the line, cost and reliability considerations etc.
- The loading limit for an inter-connecting transformer (ICT) shall be its name plate rating. However, during planning, a margin of 10% may be kept for unpredictable power flow.
- The emergency thermal limits for the purpose of planning shall be 110% of the normal thermal limits.

b) Voltage limits: The steady-state voltage limits are given below. However, at the planning stage a margin of (+-)2% may be kept in the voltage limits.

Voltages (kV_{rms})				
	Normal rating		Emergency rating	
Nominal	Maximum	Minimum	Maximum	Minimum
765	800	728	800	713
400	420	380	420	372
230	245	207	245	202
220	245	198	245	194
132	145	122	145	119
110	123	99	123	97
66	72.5	60	72.5	59

Temporary over voltage limits due to sudden load rejection:

i) 800kV system 1.4 p.u. peak phase to neutral (653 kV = 1 p.u.)
ii) 420kV system 1.5 p.u. peak phase to neutral (343 kV = 1 p.u.)
iii) 245kV system 1.8 p.u. peak phase to neutral (200 kV = 1 p.u.)
iv) 145kV system 1.8 p.u. peak phase to neutral (118 kV = 1 p.u.)
v) 123kV system 1.8 p.u. peak phase to neutral (100 kV = 1 p.u.)
vi) 72.5kV system 1.9 p.u. peak phase to neutral (59 kV = 1 p.u.)

Switching over voltage limits

i) 800kV system 1.9 p.u. peak phase to neutral (653 kV = 1 p.u.)

ii) 420kV system 2.5 p.u. peak phase to neutral (343 kV = 1 p.u.)

(iii)Reliability criteria

- **Criteria for system with no contingency ('N-0')**

a) The system shall be tested for all the load-generation scenarios as prescribed in manual.

b) For the planning purpose all the equipment shall remain within their normal thermal loadings and voltage ratings.

c) The angular separation between adjacent buses shall not exceed 30 degree.

- **Criteria for single contingency ('N-1')**

Steady-state :

a) All the equipments in the transmission system shall remain within their normal thermal and voltage ratings after a disturbance involving loss of any one of the following elements (called single contingency or 'N-1' condition), but without load shedding / rescheduling of generation:

- Outage of a 132kV or 110kV / 220kV or 230kV /400kV /765kV S/C,
- Outage of a 400kV single circuit with fixed series capacitor(FSC),
- Outage of an Inter-Connecting Transformer(ICT),
- Outage of one pole of HVDC bipole.

b) The angular separation between adjacent buses under ('N-1') conditions shall not exceed 30 degree.

Transient-state :

Usually, perturbation causes a transient that is oscillatory in nature, but if the system is stable the oscillations will be damped. The transmission system shall be stable after it is subjected to one of the following disturbances:

a) The system shall be able to survive a permanent three phase to ground fault on a 765kV line close to the bus to be cleared in 100 ms.

b) The system shall be able to survive a permanent single phase to ground fault on a 765kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and unsuccessful re-closure (dead time 1 second) followed by 3-pole opening (100 ms) of the faulted line shall be considered.

c) The system shall be able to survive a permanent three phase to ground fault on a 400kV line close to the bus to be cleared in 100 ms.

d) The system shall be able to survive a permanent single phase to ground fault on a 400kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and unsuccessful re-closure (dead time 1 second) followed by 3-pole opening (100 ms) of the faulted line shall be considered.

e) In case of 220kV / 132 kV networks, the system shall be able to survive a permanent three phase fault on one circuit, close to a bus, with a fault clearing time of 160 ms (8 cycles) assuming 3-pole opening.

f) The system shall be able to survive a fault in HVDC convertor station, resulting in permanent outage of one of the poles of HVDC Bipole.

g) Contingency of loss of generation: The system shall remain stable under the contingency of outage of single largest generating unit or a critical generating unit (choice of candidate critical generating unit is left to the transmission planner).

- **Criteria for second contingency (‘N-1-1’)**

(A) Under the scenario where a contingency N-1 has already happened, the system may be subjected to one of the following subsequent contingencies (called ‘N-1-1’ condition):

a) The system shall be able to survive a temporary single phase to ground fault on a 765kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and successful re-closure (dead time 1 second) shall be considered.

b) The system shall be able to survive a permanent single phase to ground fault on a 400kV line close to the bus. Accordingly, single pole opening (100 ms) of the faulted phase and unsuccessful re-closure (dead time 1 second) followed by 3-pole opening (100 ms) of the faulted line shall be considered.

c) In case of 220kV / 132kV networks, the system shall be able to survive a permanent three phase fault on one circuit, close to a bus, with a fault clearing time of 160 ms (8 cycles) assuming 3-pole opening.

In the ‘N-1-1’ contingency condition as stated above, if there is a temporary fault, the system shall not loose the second element after clearing of fault but shall successfully survive the disturbance.

In case of permanent fault, the system shall loose the second element as a result of fault clearing and thereafter, shall asymptotically reach to a new steady state without losing synchronism. In this new state the system parameters (i.e. voltages and line loadings) shall not exceed emergency limits, however, there may be requirement of load shedding / rescheduling of generation so as to bring system parameters within normal limits.

Criteria for generation radially connected with the grid

For the transmission system connecting generators or a group of generators radially with the grid, the following criteria shall apply:

a) The radial system shall meet 'N-1' reliability as stated above.

b) For subsequent contingency i.e. 'N-1-1' described above only temporary fault shall be considered for the radial system.

c) If the 'N-1-1' contingency is of permanent nature or any disturbance/contingency causes disconnection of such generator/group of generators from the main grid, the remaining main grid shall asymptotically reach to a new steady-state without losing synchronism after loss of generation. In this new state the system parameters shall not exceed emergency limits, however, there may be requirement of load shedding / rescheduling of generation so as to bring system parameters within normal limits.

3.3.5 Other Important guidelines and Planning criteria

(i) Reactive power compensation : Requirement of reactive power compensation like shunt capacitors, shunt reactors(bus reactors or line reactors), static VAr compensators, fixed series capacitor, variable series capacitor(thyristor controlled) or other FACTS devices shall be assessed through appropriate studies.

(a)Shunt capacitors: Reactive Compensation shall be provided as far as possible in the low voltage systems with a view to meet the reactive power requirements of load close to the load points, thereby avoiding the need for VAr transfer from high voltage system to the low voltage system. In the cases where network below 132kV/220 kV voltage level is not represented in the system planning studies, the shunt capacitors required for meeting the reactive power requirements of loads shall be provided at the 132kV/220kV buses for simulation purpose.

It shall be the responsibility of the respective utility to bring the load power factor as close to unity as possible by providing shunt capacitors at appropriate places in their system. Reactive power flow through 400/220kV or 400/132kV or 220/132(or 66) kV ICTs, shall be minimal. Wherever voltage on HV side of such an ICT is less than 0.975 pu no reactive power shall flow down through the ICT. Similarly, wherever voltage on HV side of the ICT is more than 1.025 pu no reactive power shall flow up through the ICT. These criteria shall apply under the 'N-0' conditions.

(b)Shunt reactors: Switchable bus reactors shall be provided at EHV substations for controlling voltages within the limits without resorting to switching-off of lines. The bus reactors may also be provided at generation switchyards to supplement reactive capability of generators. The size of reactors should be such that under steady state condition, switching on and off of the reactors shall not cause a voltage change exceeding 5%. The standard sizes (MVAr) of reactors are:

Voltage Level	Standard sizes of reactors (in MVAr)
400kV (3-ph units)	50, 63, 80 and 125 (rated at 420kV)
765kV (1-ph units)	80 and 110 (rated at 800kV)

Fixed line reactors may be provided to control power frequency temporary over-voltage(TOV) after all voltage regulation action has taken place within the limits under all probable operating conditions. Line reactors (switchable/ controlled/ fixed) may be provided if it is not possible to charge EHV line without exceeding the maximum voltage limits. The possibility of reducing pre-charging voltage of the charging end shall also be considered in the context of establishing the need for reactors. Guideline for switchable line reactors: The line reactors may be planned as switchable wherever the voltage limits, without the reactor(s), remain within limits specified for Transient Over Voltage conditions.

(c) Static VAr compensation (SVC) : Static VAr Compensation (SVC) shall be provided where found necessary to damp the power swings and provide the system stability for a reliable operation. The dynamic range of static compensators shall not be utilized under steady state operating condition as far as possible.

(ii) Sub-station planning criteria

The requirements in respect of EHV sub-stations in a system such as the total load to be catered by the sub-station of a particular voltage level, its MVA capacity, number of feeders permissible etc. are important to the planners so as to provide an idea to them about the time for going in for the adoption of next higher voltage level sub-station and also the number of substations required for meeting a particular quantum of load. Keeping these in view the following criteria have been laid down for planning an EHV substation:

The maximum short-circuit level on any new substation bus should not exceed 80% of the rated short circuit capacity of the substation. The 20% margin is intended to take care of the increase in short-circuit levels as the system grows. The rated breaking current capability of switchgear at different voltage levels may be taken as given below:

Voltage Level		**Rated Breaking Capacity**
132 kV	-	25 kA / 31.5 kA
220 kV	-	31.5 kA / 40 kA
400 kV	-	50 kA / 63 kA
765 kV	-	40 kA / 50 kA

Measures such as splitting of bus, series reactor, or any new technology may also be adopted to limit the short circuit levels at existing substations wherever they are likely to cross the designed limits. Rating of the various substation equipment shall be such that they do not limit the loading limits of connected transmission lines. Effort should be to explore possibility of planning a new substation instead of adding transformer capacity at an existing substation when the capacity of the existing sub-station has reached as given in column (B) in the following table. The capacity of any single sub-station at different voltage levels shall not normally exceed as given in column (C) in the following table:

Voltage Level (A)	**Transformer Capacity**	
	Existing capacity (B)	**Maximum Capacity (C)**
765 kV	6000 MVA	9000 MVA
400 kV	1260 MVA	2000 MVA
220 kV	320 MVA	500 MVA
132 kV	150 MVA	250 MVA

While augmenting the transformation capacity at an existing substation or planning a new substation the fault level of the substation shall also be kept in view. If the fault level is low the voltage stability studies shall be carried out.

Size and number of interconnecting transformers (ICTs) shall be planned in such a way that the outage of any single unit would not over load the remaining ICT(s) or the underlying system.

A stuck breaker condition shall not cause disruption of more than four feeders for the 220kV system and two feeders for the 400kV system and 765kV system.

Note – In order to meet this requirement it is recommended that the following bus switching scheme may be adopted for both AIS and GIS and also for the generation switchyards:

220kV – 'Double Main' or 'Double Main & Transfer' scheme with a maximum of eight(8) feeders in one section

400kV and 765kV – 'One and half breaker' scheme

(iii) Wind and solar projects

The capacity factor for the purpose of maximum injection to plan the evacuation system, both for immediate connectivity with the ISTS/Intra-STS and for onward transmission requirement, may taken as given below:

Voltage level/ Aggregation level	132kV / Individual wind/solar farm	220kV	400kV	State (as a whole)
*Capacity Factor (%) *May be revised from time to time	80 %	75 %	70 %	60 %

Capacity factor, considering diversity in wind/solar generation, is the ratio of maximum generation available at an aggregation point to the algebraic sum of capacity of each wind machine / solar panel connected to that grid point. Actual data, wherever available, should be used. In cases where data is not available the Capacity factor may be calculated as above table.

The 'N-1' criteria may not be applied to the immediate connectivity of wind/solar farms with the ISTS/Intra-STS grid i.e. the line connecting the farm to the grid and the step-up transformers at the grid station.

As the generation of energy at a wind farm is possible only with the prevalence of wind, the thermal line loading limit of the lines connecting the wind machine(s)/farm to the nearest grid point may be assessed considering 12 km/hour wind speed.

The wind and solar farms shall maintain a power factor of 0.98 (absorbing) at their grid inter-connection point for all dispatch scenarios by providing adequate reactive compensation and the same shall be assumed for system studies.

(iv) Nuclear power stations

In case of transmission system associated with a nuclear power station there shall be two independent sources of power supply for the purpose of providing start-up power. Further, the angle between start-up power source and the generation switchyard should be, as far as possible, maintained within 10 degrees.

The evacuation system for sensitive power stations viz., nuclear power stations, shall generally be planned so as to terminate it at large load centres to facilitate islanding of the power station in case of contingency.

(v) Guide line for planning HVDC Transmission System

The option of HVDC bipole may be considered for transmitting bulk power (more than 2000 MW) over long distance (more than 700 km). HVDC transmission may also be considered in the transmission corridors that have AC lines carrying heavy power flows (total more than 5000 MW) to control and supplement the AC transmission network.

The ratio of fault level in MVA at any of the convertor station (for conventional current source type), to the power flow on the HVDC bipole shall not be less than 3.0 under any of the load-generation and contingencies conditions mentioned in the Manual. Further, in areas where multiple HVDC bipoles are feeding power (multi in feed), the appropriate studies be carried at planning stage so as to avoid commutation failure.

(vi) Guidelines for voltage stability

Voltage Stability Studies: These studies may carried out using load flow analysis program by creating a fictitious synchronous condenser at critical buses which are likely to have wide variation in voltage under various operating conditions i.e. bus is converted into a PV bus without reactive power limits. By reducing desired voltage of this bus, MVAr generation/ absorption is monitored. When voltage is reduced to some level it may be observed that

MVAr absorption does not increase by reducing voltage further instead it also gets reduced. The voltage where MVAr absorption does not increase any further is known as Knee Point of Q-V curve. The knee point of Q-V curve represents the point of voltage instability. The horizontal 'distance' of the knee point to the zero-MVAr vertical axis measured in MVAr is, therefore, an indicator of the proximity to the voltage collapse.

Each bus shall operate above Knee Point of Q-V curve under all normal as well as the contingency conditions as discussed above. The system shall have adequate margins in terms of voltage stability.

(vii) Guidelines for consideration of zone – 3 settings

In some transmission lines, the Zone-3 relay setting may be such that it may trip under extreme loading condition. The transmission utilities should identify such relay settings and reset it at a value so that they do not trip at extreme loading of the line. For this purpose, the extreme loading may be taken as 120% of thermal current loading limit and assuming 0.9 per unit voltage (i.e. 360 kV for 400kV system, 689 kV for 765kV system). In case it is not practical to set the Zone-3 in the relay to take care of above, the transmission licensee/owner shall inform CEA, CTU/STU and RLDC/SLDC along with setting (primary impendence) value of the relay. Mitigating measures shall be taken at the earliest and till such time the permissible line loading for such lines would be the limit as calculated from relay impedance assuming 0.95 pu voltage, provided it is permitted by stability and voltage limit considerations as assessed through appropriate system studies.

3.4 TRANSMISSION PLANNING STUDIES

3.4.1 Studies and Analysis for Transmission Planning

In the planning phase, transmission requirements for generation projects and system reinforcement needs are evolved, based on detailed system studies and analysis keeping in view various technological options, planning criteria and regulations. These studies/analysis are problem-specific, that is, in a particular exercise, only a sub-set of the analysis/studies may be necessary. The system shall be planned based on one or more of the following power system studies:

i) Power Flow Studies

ii) Short Circuit Studies

iii) Stability Studies (including transient stability ** and voltage stability)

iv) EMTP studies (for switching / dynamic over-voltages, insulation coordination, etc)

(** Note : *The candidate lines, for which stability studies may be carried out, may be selected through results of load flow studies. Choice of candidate lines for transient stability studies are left to transmission planner. Generally, the lines for which the angular difference between its terminal buses is more than 20 degree after contingency of one circuit may be selected for performing stability studies.)*

3.4.2 Power system model for simulation studies

3.4.2.1 Consideration of voltage level

I. For the purpose of planning of the ISTS:

a) The transmission network may be modeled down to 220kV level with exception for North Eastern Region and parts of Uttrakhand, Himachal and Sikkim which may be modeled down to 132kV level.

b) The generating units that are stepped-up at 132kV or 110kV may be connected at the nearest 220kV bus through a 220/132 kV transformer for simulation purpose. The generating units smaller than 50 MW size within a plant may be lumped and modeled as a single unit, if total lumped installed capacity is less than 200 MW.

c) Load may be lumped at 220kV or 132kV/110kV, as the case may be.

II. For the purpose of planning of the Intra-STS System, the transmission network may be modeled down to 66kV level or up to the voltage level which is not in the jurisdiction of DISCOM. The STUs may also consider modeling smaller generating units, if required.

3.4.2.2 Time Horizons for transmission planning

(i) Concept to commissioning for transmission elements generally takes three to five years; about three years for augmentation of capacitors, reactors, transformers etc., and about four to five years for new transmission lines or substations. Therefore, system studies for firming up the transmission plans may be carried out with 3-5 year time horizon.

(ii) Endeavour shall be to prepare base case models corresponding to load-generation scenarios given in Manual for a 5 year time horizon. These models may be tested applying the relevant criteria mentioned in this manual.

3.4.3 Load - generation scenarios

The load-generation scenarios shall be worked out so as to reflect in a pragmatic manner the typical daily and seasonal variations in load demand and generation availability.

3.4.4 Load demands

3.4.4.1 Active power (MW)

i. The system peak demands (state-wise, regional and national) shall be based on the latest Electric Power Survey (EPS) report of CEA. However, the same may be moderated based on actual load growth of past three (3) years.

ii. The load demands at other periods (seasonal variations and minimum loads) shall be derived based on the annual peak demand and past pattern of load variations. In the absence of such data, the season-wise variation in the load demand may be taken as given in Manual.

iii. While doing the simulation, if the peak load figures are more than the peaking availability of generation, the loads may be suitably adjusted substation-wise to match with the availability. Similarly, while doing the simulation, if the peaking availability is more than the peak load, the generation dispatches may be suitably reduced, to the extent possible, such that, the inter-regional power transfers are high.

iv. From practical considerations the load variations over the year shall be considered as under:

   a. Annual Peak Load

   b. Seasonal variation in Peak Loads for Winter, Summer and Monsoon

   c. Seasonal Light Load (for Light Load scenario, motor load of pumped storage plants shall be considered)

v. The sub-station wise annual load data, both MW and MVAr shall be provided by the State Transmission Utilities.

3.4.4.2 Reactive power (MVAr)

i. Reactive power plays an important role in EHV transmission system planning and hence forecast of reactive power demand on an area-wise or substation-wise basis is as important as active power forecast. This forecast would obviously require adequate data on the reactive power demands at the different substations as well as the projected plans for reactive power compensation.

ii. For developing an optimal ISTS, the STUs must clearly spell out the substation-wise maximum and minimum demand in MW and MVAr on seasonal basis. In the absence of such data the load power factor at 220kV and 132kV voltage levels may be taken as 0.95 lag during peak load condition and 0.98 lag during light load condition. The STUs shall provide adequate reactive compensation to bring power factor as close to unity at 132kV and 220kV voltage levels.

3.4.5 Generation dispatches and modeling

i. For the purpose of development of Load Generation scenarios on all India basis, the all India peaking availability may be calculated as per the norms given in Manual.

ii. For planning of new transmission lines and substations, the peak load scenarios corresponding to summer, monsoon and winter seasons may be studied. Further, the light load scenarios (considering pumping load where pumped storage stations exist) may also be carried out as per requirement.

iii. For evolving transmission systems for integration of wind and solar generation projects, high wind/solar generation injections may also be studied in combination with suitable conventional dispatch scenarios. In such scenarios, the Intra-State generating station of the RES purchasing State may be backed-down so that impact of wind generation on the ISTS grid is minimum**. The maximum generation at a wind/solar aggregation level may be calculated using capacity factors as per the norms given Chapter 3..

***<u>Note:</u>*

1) As per the grid code, it is the responsibility of each SLDC to balance its load and generation and stick to the schedule issued by RLDC. Accordingly, it follows that in case of variation in generation from Renewable Energy Source (RES) portfolio, the State should back-down/ramp-up its conventional (thermal/hydro) generation plants or revise their drawal schedule from ISGS plants and stick to the revised schedule. The Intra-State generating station should be capable of ramping-up/backing-down based on variation in RES generation so that impact of variability in RES on the ISTS grid is minimum.

2) Further to address the variability of the wind/solar projects, other aspects like reactive compensation, forecasting and establishment of renewable energy control centers may also be planned by STUs.

iv. **Special area dispatches**

a) Special dispatches corresponding to high agricultural load with low power factor, wherever applicable.

b) Complete closure of a generating station close to a major load centre.

v. In case of thermal units (including coal, gas/diesel and nuclear based) the minimum level of output (ex-generation bus, i.e. net of the auxiliary consumption) shall be taken as not less than 70% of the rated installed capacity. If the thermal units are encouraged to run with oil support, they may be modeled to run up to 25% of the rated capacity.

vi. The generating unit shall be modeled to run as per their respective capability curves. In the absence of capability curve, the reactive power limits(Q_{max} and Q_{min}) for generator buses can be taken as :

a. Thermal Units : Q_{max} = 60% of P_{max}, and Q_{min} = (-) 50% of Q_{max}

b. Nuclear Units : Q_{max} = 60% of P_{max}, and Q_{min} = (-) 50% of Q_{max}

c. Hydro Units : Q_{max} = 48% of P_{max}, and Q_{min} = (-) 50% of Q_{max}

vii. It shall be duty of all the generators to provide technical details such as machine capability curves, generator, exciter, governor, PSS parameters etc., for modeling of their machines for steady-state and transient-state studies, in the format sought by CTU/STUs. The CTU and STUs shall provide the information to CEA for preparation of national electricity plan.

3.4.6 Short circuit studies

i) The short circuit studies shall be carried out using the classical method with flat pre-fault voltages and sub-transient reactance (X''_d) of the synchronous machines.

ii) MVA of all the generating units in a plant may be considered for determining maximum short-circuit level at various buses in system. This short-circuit level may be considered for substation planning.

iii) Vector group of the transformers shall be considered for doing short circuit studies for asymmetrical faults. Inter-winding reactances in case of three winding transformers shall also be considered. For evaluating the short circuit levels at a generating bus (11kV, 13.8kV, 21kV etc.), the unit and its generator transformer shall be represented separately.

iv) Short circuit level both for three phase to ground fault and single phase to ground fault shall be calculated.

v) The short-circuit level in the system varies with operating conditions, it may be low for light load scenario compared with for peak load scenario, as some of the plants may not be on-bar. For getting an understanding of system strength under different load-generation / export-import scenarios, the MVA of only those machines shall be taken which are on bar in that scenario.

3.4.7 Planning margins

(i) In a very large interconnected grid, there can be unpredictable power flows in real time due to imbalance in load-generation balance in different pockets of the grid. This may lead to overloading of transmission elements during operation, which cannot be predicted in advance at the planning stage. This can also happen due to delay in commissioning of a few planned transmission elements, delay/abandoning of planned generation additions or load growth at variance with the estimates. Such uncertainties are unavoidable and hence some margins at the planning stage may help in reducing impact of such uncertainties. However, care needs to be taken to avoid stranded transmission assets. Therefore, at the planning stage following planning margins may be provided:

(ii) Against the requirement of Long Term Access sought, the new transmission lines emanating from a power station to the nearest grid point may be planned considering overload capacity of the generating stations in consultation with generators.

(iii) The new transmission additions required for system strengthening may be planned keeping a margin of 10% in the thermal loading limits of lines and transformers .Further, the margins in the inter-regional links may be kept as 15%.

(iv) At the planning stage, a margin of about + 2% may be kept in the voltage limits and thus the voltages under load flow studies (for ‘N-0’ and ‘N-1’ steady-state conditions only) may be maintained within the limits given below:

Voltage (kV_{rms}) (after planning margins)		
Nominal	**Maximum**	**Minimum**
765	785	745
400	412	388
230	240	212
220	240	203
132	142	125

Voltage (kV_{rms}) (after planning margins)		
Nominal	**Maximum**	**Minimum**
110	119	102
66	70	62

(v) In planning studies all the transformers may be kept at nominal taps and On Load Tap Changer (OLTC) may not be considered. The effect of the taps should be kept as operational margin.

(vi) For the purpose of load flow studies at planning stage, the nuclear generating units shall normally not run at leading power factor. To keep some margin at planning stage, the reactive power limits (Qmax and Qmin) for generator buses may be taken as:

Type of generating unit	Q_{max}	Q_{min}
Nuclear units	Q_{max}= 0.50 x P_{max}	Q_{min}= (-)0.10 x P_{max}
Thermal Units (other than Nuclear)	Q_{max}= 0.50 x P_{max}	Q_{min}= (-)0.10 x P_{max}
Hydro units	Q_{max}= 0.40 x P_{max}	Q_{min}= (-)0.20 x P_{max}

Notwithstanding above, during operation, following the instructions of the System Operator, the generating units shall operate at leading power factor as per their respective capability curves.

3.5 TECHNOLOGICAL OPTIONS

The various technological options that are available now for 12th /13th Plan time frame are given below. Consideration of these options is problem-specific, that is, in a particular exercise, only a limited number of options may be relevant.

- ⇨ 220kV AC, 400kV AC, 765kV AC, 1200kV AC
- ⇨ HVDC/UHVDC (±500kV, ±600kV, ±800kV)
- ⇨ Hybrid model (AC with HVDC system)
- ⇨ High capacity lines with high conductor temperature option
- ⇨ Series compensation, dynamic reactive power compensation- TCSC, SVC, STATCOM/FACTS

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CHAPTER - 4

NEW TECHNOLOGIES IN TRANSMISSION SYSTEM

4.1 TECHNOLOGIES IN DESIGN & CONSTRUCTION OF TRANSMISSION LINES

Following new technologies are being implemented in the transmission system to meet the grid challenge as case to case basis:

4.1.1 Emergency Restoration System

Under adverse situations, immediate and temporary restoration of transmission lines is possible by deploying the "Emergency Restoration Systems (ERS)''. Grid Standards notified by Central Electricity Authority (CEA) stipulate that every transmission licensee shall have an arrangement for restoration of transmission lines of at least 220 kV and above through the use of ERS. CEA has formulated guidelines for planning, deployment and procurement of such ERS infrastructure. Many utilities have already procured ERS and some others are in process of procuring. Indigenization of product needs to be promoted considering the requirement of utilities and monopoly of few limited overseas manufacturers.

4.1.2 Use of Polymer based Insulation and RTV coating

Polymer insulators (non-ceramic / silicone rubber insulators) are widely used over conventional porcelain insulators due to lighter in weight, good contamination / pollution performance because of hydrophobicity, ease of operation and less prone to vandalism. Similarly, Room Temperature Vulcanized (RTV) Silicone Rubber coating on porcelain insulators is a practical option for improving the flashover performance in presence of the pollution without compromising on the mechanical aspects of equipment housing in the substation.

4.1.3 High Resolution Stereoscopic satellite images

High Resolution Stereoscopic satellite images shall be used for transmission line routing and assessment of vegetation / other natural hindrance. This can help in reducing the man-hours as well as cost and time involved in physical routing of Transmission line.

4.2 TECHNOLOGIES IN DESIGN & CONSTRUCTION OF SUBSTATIONS

4.2.1 Mobile Substations

In the case of any natural or other disasters, the immediate restoration of power supply, particularly to vital services or installations, becomes one of the prime objectives. The vehicle mounted mobile substation (comprising of trailer, incoming and outgoing HV and LV hybrid switchgears, power transformer, and associated connectors) can be put into immediate service as a quick substitute to conventional substation of 220kV and below voltage class to resume power supply in short time in case of emergency/natural or other disasters leading to total collapse/disruption of power supply.

4.2.2 Controlled Switching Devices

Random switching of Circuit Breaker can result in high transient over voltages and / or high inrush current. These transients generate stresses for all substation and network equipment. In accordance with the power system requirement, the circuit breakers of 400kV and above voltage class may be provided with Controlled Switching Devices (for point of wave switching as an alternative to PIR) for controlling switching over voltages on lines of length more than 200km and minimizing switching transients & inrush currents in transformers and reactors thereby increase the life of high voltage equipment and enhance Power system security. Controlled switching devices are now well proven to control switching over voltages during switching of transformers and reactive elements to minimize switching transients and inrush currents.

4.2.3 Digital Substation

Traditional substations have always relied on copper cable/wiring together with primary equipment like circuit breakers, conventional current and voltage transformers and protection relays to control of the electricity. But digital technologies, communications and standards are driving the evolution of digital substations.

Digital substations incorporate Intelligent Electronic Devices (IEDs) with integrated information and communication technology, Non-Conventional Instrument Transformers (NCIT), merging units, and phasor measurement units that are interfaced with the process bus and station bus architecture. NCITs make a substation simpler, cheaper, smaller, more efficient and safer by replacing secondary wirings and eliminating the dangers associated with open

CT circuits (Current Transformers) and of electrical hazards in general. The IED is a microprocessor-based protection and control device for power equipment, such as circuit breakers, transformers and capacitor banks. Digital communications via fibre optic cables will replace traditional copper connections using analog signals, increasing safety, reliability, flexibility and availability, while reducing cost, risk and environmental impact. Synchronization is a very critical aspect of digital substations.

Digital substation will improve efficiency, safety and system visibility in the power grid. A digital substation is a key component enabling a smarter grid. Towards digitalization of the substation, architectures like Process-Bus may be adopted. The deployment of IEC 61850-9-2 based Process-Bus facilitates replacement of traditionally used copper cables with fibre optic cables and the usage of common protocol allows for interoperability among various makes of Intelligent Electronic Devices. The Process-Bus architecture would ease the maintenance and trouble-shooting in future and also restoration time will be extremely low in case of any eventuality.

4.2.4 Optical CTs/PTs

Non-Conventional Instrument Transformers (NCIT) such as Optical CTs/PTs eliminate problem of Open circuit in CTs, errors in IT, CT saturation, no need to specify accuracy class, no blasting and damage to nearby equipment and no Ferro resonance issue in CVT/PT.

4.2.5 Ester Oil

Use of Environmental friendly, bio-degradable Ester oil (synthetic / Natural Easter) having high fire point compared to mineral oil may be considered for transformers up to 220kV level. Transformers with ester oils are in operation even at 550kV level. Further, new types of insulating oils like natural ester, synthetic ester, nano-doped oils etc. which has advantages in terms of bio degradability or have better performance compared to conventional mineral oil may be developed for use in power transformer.

4.3 ADOPTION OF NEW TECHNOLOGIES IN PLANNING AND GRID OPERATION

4.3.1 Regulation of Power Flow and FACTS Devices

FACTS devices are of two categories and are connected to the power system either as a parallel / shunt Compensation (most common) or as a series compensation device. Static Var Compensator (SVC) and STACOM are shunt connected reactive power compensation element of FACTS family capable of providing dynamic control of system voltage at the point of connection with a grid leading to reduction in transmission & distribution losses. Static Synchronous Compensator (STATCOM) is basically a Voltage Source Converter (VSC) and can act as either a source or sink of reactive AC power to an electricity network. VSCs operating with the specified vector control strategy can perform independent control of active/reactive power at both ends. Similarly, series compensating devices are in operation in Indian Power system inform of either as Fixed Series Compensation(FSC) or as Thyristor Controlled Series Compensation (TCSC). these devices are primarily to be used to control under transient/dynamic operation of the grid and need to be deployed after carrying out relevant studies on case to case basis.

4.3.2 Fault Current Limiter/ Series Reactor

4.3.2.1 For meeting the ever increasing load growth, more and more generators and transmission network are being added. This has resulted into high short circuit level particularly in those areas of network having proximity to large generation and higher number of interconnections. The short circuit level at 400 & 220 kV buses has been increasing and likely to cross the rating of the equipment shortly. So there is need to implement options for controlling the short circuit currents.

4.3.2.2 Short circuit is an indication of strength of the bus and is dependent on network connectivity. A high short circuit level is desirable from grid operation point of view as it improves the system stability i.e. higher the short circuit level it is closer to the equivalent 'Infinite Bus'. However, this would result in large short circuit currents leading to higher stress on equipment during faults. There are two options to address short circuit level (a) Upgrade the existing stations for higher fault levels (b) Limits the short circuit levels.

(a) Upgrading and replacing old switchgear is a simple technique. However, it is a very costly option and many a times this may not be a practical solution. For example, if equipment need to be replaced at a generating station, a long shut down is required and also replacement/ augmentation of bus bar arrangement and earth mat may also be required which may not be practically feasible.

(b) The other option is to limit the short circuit levels. To achieve the same, following alternatives can be considered:

(i) **Splitting / Opening of the ring main:** Splitting the grid is the simplest method to curtail short circuit levels. It is effective when envisaged during planning stage itself. However, splitting of existing bus is difficult and may have an adverse effect on power flow under emergency conditions reducing the stability margins & reliability of the supply substantially.

(ii) **Current limiting reactors:** The main reason for high short circuit level is very short transmission lines with close proximity to generators. One of the solutions would be to increase the electrical distance by introduction of series reactor.

(iii) **Series Reactors:** Series reactor can be connected in the grid by two possible methods (i) Series bus reactors (ii) Series line Reactors (Fig.1). While series bus reactors require lower impedance values, introduction of the same in an existing bus may be difficult as generally space is not available at the existing switchyards. On the other hand Series line reactors can be easily installed on existing lines contributing high short circuit current. In the case length of the lines are very small, the impedance of series line reactors required for controlling of the short circuit would be much higher than the line impedance itself. Normally series reactor can be considered on lines contributing more than 4 kA. While planning the type of series reactor and its ohmic level it should be ensured that there is no unbalance loading and there is no high voltage drop. Studies indicate that normally series reactor can be considered on lines less than 150 km.

4.3.3 Planning of Phase-shifters in India

In order to achieve the optimum utilization of transmission lines power flows needs to be controlled which can be achieved by using a phase shifting transformer (PST). Phase-shifting transformer can be used for controlling the power flow through various lines in a power transmission network. This device changes the effective phase displacement between the input voltage and the output voltage of a transmission line for effecting power flow control. These transformers are site specific and need to be planned on case to case basis through proper system studies. Already one phase shifting transformer is operating in Kothagudem TPS in Telangana. Preliminary studies were also carried out for use/deployment of phase shifting in inter regional link between southern region and NEW grid.

4.4 TECHNOLOGIES FOR CONSERVING RIGHT OF WAY FOR TRANSMISSION

LINES

4.4.1 Hybrid sub-station

A hybrid sub-station can be considered as a techno-economic solution for locations where space is a constraint and also for sub-station renovation or augmentation. A hybrid sub-station can be outdoor or indoor type. In a hybrid sub-station, the bus-bar is air insulated type. Switchgear for a hybrid sub-station have some or all functional units enclosed in SF6 gas insulated housing. A hybrid substation requires less space than conventional AIS but more than GIS, however the cost is less than GIS.

4.4.2 Covered Conductor

Covered conductors may be one of the solutions for the transmission and distribution lines passing through the forest areas where problem of accidental electrocution of animals is very persistent. It will also be helpful in cases where trees in forest or densely vegetated areas touching the live conductor due to wind forces leading to frequent outage of the lines and sometimes result in burning of the trees. Covered conductor can reduce the Right of Way (RoW) requirement to a great extent and can help in transport of power upto 132kV level in a narrow corridor.

4.4.3 EHV XLPE Cable and GIL

Due to increasing urbanization and scarcity of land, it has become very difficult for utilities to construct overhead transmission & distribution lines. ROW issues have always resulted in inordinate delay in execution of transmission projects. To avoid such problems utilities, resort to use of EHV XLPE Cables. Due to technical limitations, the use of XLPE cable at EHV level is restricted to a certain length. The creation of unavoidable joints, and terminations are vulnerable to failure leading to outage of cable system. Gas Insulated Lines (GIL) in certain areas of application is considered to be a good alternative to EHV XLPE cables, especially where normal current / power flow requirement is high and length is short. Focus on indigenization of XLPE cable at 400kV level and extension of domestic GIS manufacturing facilities for production of GIL need to be explored.

4.4.4 New tower designs which require reduced Right-of-Way, less tonnage of steel and aesthetically appealing may be developed and deployed in the transmission network.

4.5 ADOPTION OF NEW TECHNOLOGIES IN COMMUNICATION

4.5.1 OPGW Based Communication in Power Sector

Power system communication requirements are reliability, availability and security of the highest order. Past experience shows that fiber optics installed on Overhead Power lines is the most reliable form of communication medium due to least amount of down time. Hence Fiber Optic based Communication System is considered essential to meet the power system communication bandwidth requirements with reliability.

The PLCC based communication system has limitations in regard to data communication as the performance of this system deteriorates after two hops. Further, due to frequency congestion only limited number of channels can be provided on PLCC.

Power System in the country is expanding very fast and with increased number of interconnections between Regions, many new technologies are being implemented. In addition, Indian Grid is characterized by wide variation of Power flow due to variation in demand / generation during day / seasons. Further, consumer aspiration for quality and reliable power supply is increasing.

All the above, with increasing complexity of Grid operation manifold, necessitates dynamic monitoring of Grid parameters / conditions on real-time basis. The existing SCADA/EMS provides the data which are steady state in nature and not suitable for dynamic monitoring and control for the Grid due to high degree of latency of tele-metered data and also non-synchronized sampling of data. Emerging technologies like Phasor Measurement Unit (PMU), Wide Area Measurement (WAM) system provide dynamic monitoring of network on real time basis. Such monitoring through the said measurements shall facilitate development of various control, regulation and preventive features like Remedial Action Schemes (RAS), System Integrated Protection Scheme (SIPS), Adaptive islanding, Self-healing Grid etc.

These emerging technologies are being deployed for development of Smart Grid for transmission system. These emerging technologies would require communication system with least latency and high reliability. The OPGW based Fiber Optic based communication system would be most suitable for such applications. Further OPGW caters the current differential protection being considered for transmission lines nowadays as per requirement.

Considering above aspects, it emerged after detailed deliberations that in all upcoming transmission lines of 132kV and above OPGW needs to be provided in place of one of the earth wire(s) as part of transmission system planning. In Central Sector, POWERGRID has taken up OPGW requirement for all upcoming lines. All utilities at State level have to consider the same during planning of transmission system. Further CTU is considering OPGW in place of one of the earth wire(s) for Transmission lines to be taken up on TBCB route.

4.5.2 Communication Equipment and DC Power Supply

In view of provision of OPGW on upcoming transmission line, terminal equipment such as SDH, PDH and associated DC Power Supply shall be required at end stations for OPGW communication. Requirement of these equipment is to be taken care along with Bay Equipment /sub-station equipment as part of end sub-stations implementation so as to ensure timely availability of communication along with commissioning of sub-stations. 48 V DC Power Supply requirement to be planned in a comprehensive manner considering suitable capacity to cater all applications with a view to optimize space and avoid multiple systems in a sub-station/control centre.

Remote Terminal Unit(RTU)/Sub-Station Automation System(SAS)/up gradation required for transmission of Sub-station/Generating Station data to SLDC/RLDC as the case may be for grid management are to be provided by concerned agency establishing/bay extension of the sub-station/generating station so that data availability at SLDC/RLDC is ensured at the time of commissioning of sub-station/Generating station itself. RTU/SAS to be provided shall have provision of data integration with serial (IEC 60870-5-101) as well as Ethernet (IEC 60870-5-104) protocol for smooth integration with SLDC/RLDC.

4.6 WIDE AREA MEASUREMENT SYSTEM

Indian power system has been experiencing prenominal growth with complexity increasing in all fronts viz. generation, transmission and distribution. Managing grid safety, security and reliability is a great challenge in the new regime of open electricity market. Further, for sustainability, emphasis has been given to develop renewable energy generation in a big scale including its integration with the grid, while variability & intermittency in their output is a new challenge in system operation. The grid would soon be having 1000 MW generating units, 4000 MW single power plants, high capacity 765 kV and HVDC transmission links feeding large cities and various critical load. Any incident - natural calamity etc., even on single element of this capacity, has the potential to cause a major grid disturbance.

Highest order of real time monitoring and control system is a must to avoid or to reduce the impact of such incidences. To address these issues, it is essential to introduce intelligence in transmission through smart grid technology applications across the grid.

Application of synchrophasor technology using Phasor Measurement Unit(PMU), integrated with Phasor Data Concentrators(PDC) has emerged to address above critical developments in the grid. Synchrophasor measurements using PMUs and PDCs through fibre optic communication backbone over wide-area in spatially distributed Indian power system for real time measurements, monitoring and visualization of power system as well as taking preventive/corrective control actions in the new regime of grid management with improved efficiency.

Wide Area Measurement System (WAMS) shall enable synchronous measurement of real time grid parameters across the widely spread grid with low latency in data transfer to control centres which would be very effective in reliable, secure and economical grid operation. It would facilitate integration of large quantum of intermittent and variable renewable generation into the grid. This shall also facilitate to estimate the transmission capability in a more realistic way which shall bring efficiency in operation as well as economy in cost of power supply.

This requires PMU installation at all 400kV & above substations and transmission lines, 220kV generation switchyard, HVDC terminals, all inter-regional and inter-national links under State sector and ISTS network & IPP stations and all Renewables Generating station. POWERGRID is implementing URTDSM Project which covers installation of 1186 nos PMUs in phase-1 and 550 nos PMUs in Phase-2 for sub-stations/Generating Stations commissioned in 2014-15. Presently Phase-1 PMUs is under implementation and phase-2 implementation to be taken up based on feedback on results of phase-1 project and also CERC directives. Beyond 2014-15, provision of PMUs for sub-stations/Generating stations is to be ensured by concerned utility, be it State Sector, Central Sector or IPP so that PMU data is available at the time of commissioning of the sub-station/Generating Station.

4.7 TECHNOLOGIES IN ENERGY STORGE SYSTEM

4.7.1 Energy Storage – Need for Indian Power System

It is expected that by the end of 2016-17, share of renewable generation capacity in India shall be about 17%. Renewable energy is intermittent &

variable in nature and also generally available when demand is other than peak condition. To maintain grid security with higher penetration of renewable energy, effective balancing mechanisms like energy storage systems are required besides other measures. It's store renewable energy during surplus hours and inject energy in the grid when required depending upon storage capacity. In addition, it can also address intermittency of RE to a large extent.

Energy Storage systems have a broad portfolio of technologies such as pumped storage hydro, compressed air energy storage, batteries, flywheels, thermal energy storage, fuel cell, superconducting magnetic energy storage, ultra-capacitors, hydrogen storage etc. These energy storage systems can be used for frequency regulation, energy time shift, backup power, load leveling, voltage support, grid stabilization etc. As marked earlier, the renewable integration into the grid energy storage would play a decisive role in scheduling intermittent and variable renewable power. Further, the excess energy generated by renewable energy in other than peak time can be stored and used at peak times.

4.7.2 Energy Storage Systems

(i) **Pumped Storage Hydro Plants (PSHP):** PSHP has simplicity of design, relatively low maintenance cost, and similarity in operation to hydroelectric generating system, which made it the industry standard for energy storage. These systems have quick ramping properties, i.e. it can be fully loaded by 10sec. Energy storage in PSHP is proportional to the volume of water available and the differential height. The operation and maintenance required for this system is minimal as compare to other storage devices. However, they require very specific geographic features that limit unit siting. These systems have high capital cost and long gestation period.

(ii) **Compressed Air Energy Storage (CAES):** CAES systems are basically high efficient combustion turbine plants. The system is similar to standard combustion turbine systems; which makes it is easy to deploy into existing power networks. In CAES systems, off-peak grid power is used to pump air to underground and stored at high pressure. The compressed air uses less fuel to get heated up so increases efficiency. CAES startups within 5-12 min with a ramp rate of 30% of maximum load per minute hence become fit for meeting peak load demand. In CAES working cycle, heat and unwanted gases are generated during compression and combustion process respectively that causes ecological concerns.

(iii) **Flywheels:** Flywheels store energy in the form of kinetic energy. The flywheel continuously rotates with the energy from grid, and when energy supply is interrupted the rotating flywheel supplies kinetic energy to grid. These systems are extremely rapid in their response, but the energy supply lasts only for 5-50 seconds. Hence they are suitable for frequency regulation use. The main applications of flywheel energy storage are transportation, rail vehicles, rail electrification, uninterruptible power supplies, pulse power, grid energy storage, wind turbines etc. The initial project cost is on the higher side. Another disadvantage of this system is the high rate of frictional losses, which results into more self-discharge and poor efficiency. Nevertheless, technological developments of low friction bearings are improving the efficiencies these days.

(iv) **Electrochemical Energy Storage or Battery energy storage systems (BESS):** BESS technology efficiently stores electricity in chemicals and reversibly release it according to demand. The good response time of BESS technology makes it suitable for application in frequency regulation. Other important characteristics of recent BESS systems are efficiency, response time, deep cycle discharge, life cycle, low maintenance, low cost, high energy density, zero emission etc. Some of the commonly used BESS technologies are Advanced Lead Acid, Lithium ion (Phosphate / Cobalt / Manganese / Titanate Oxide), Sodium Nickel Chloride (NaNiCl2) batteries, and Flow batteries (Zinc Bromine, Vanadium Redox etc.). These technologies are suitable for ramping, frequency regulation, energy time shift, voltage support, black start etc.

(v) **Fuel cell:** A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction with oxygen or another oxidizing agent. Hydrogen is the most common fuel, but hydrocarbons such as natural gas and alcohols like methanol are sometimes used. Fuel cells are different from batteries as they require a constant source of fuel and oxygen to run, but they can produce electricity continually for as long time till these inputs are supplied. Based on the electrolytes used fuel cell may be classified in following types: Proton exchange membrane fuel cells (PEMFC), Solid oxide fuel cells (SOFCs), Molten carbonate fuel cells (MCFCs).

(vi) **Thermal Energy Storage (TES):** Thermal energy is stored by heating or cooling a storage medium so that the stored energy can be used at a later time for heating/cooling applications and power generation. These days' renewable energy integration requirements have made its centralized use as well. In Concentrated Solar Plants (CSP) solar energy is stored in the form of thermal energy, which is used in night time to get electricity. There are mainly two types of thermal energy storage system, namely; as given below: sensible heat storage and phase change energy storage.

(vii) Super Conducting Magnetic Energy Storage (SMES) System: In this energy storage technology flowing current generates a magnetic field in which the energy is stored. The current continues to loop around the coil indefinitely until it is needed and is discharged. These devices store electrical energy essentially with no losses due to superconducting coils. The superconducting coils are needed to be super-cooled to very low temperatures, even up to 4.5K. These devices require a cryogenic cooling system using liquid nitrogen, helium etc. These devices are extremely efficient, fast-responding, scalable to large sizes, and environmentally friendly, yet very costly at present.

(viii) Ultra Capacitors: These are also known as super capacitor, ultra-capacitor, pseudo capacitor, electric double-layer capacitor, and giga capacitor. These devices are similar to conventional capacitor, but have capability to hold orders of magnitude more energy. Ultra capacitors have two electrode plates and an electrolyte in between and when a power source is connected, ions make their way to the electrodes with opposite charges due to the electric field. Unlike batteries that would wear out after being cycled due to numerous chemical reactions, the lifetime of these devices is not significantly impacted by cycling. Another, advantage of electrochemical capacitors over batteries is the ability to charge and discharge more rapidly.

(ix) Hydrogen Storage: Hydrogen gas has the largest energy content (120 MJ/kg) of any fuel, which is about 2.5 times of natural gas. Therefore, a relatively small amount of hydrogen is needed to store significant amounts of energy. However, hydrogen is not naturally available as ready to use fuel. Therefore, it is used as carrier for storing or transporting energy. Hydrogen is generated through electrolysis, where water is split into hydrogen and oxygen using electricity in an electrolyzer. Mainly following three types of electrolyzers are used for this process: Polymer electrolyte membrane electrolyzer, Alkaline electrolyzer, and Solid oxide electrolyzer. Hydrogen generated through above process is converted to useful energy by fuel cell or in combined cycle gas power plant as fuel. The efficiency in conversion is on the lower side, i.e. 50-60%.

4.7.3 Energy Storage Systems Worldwide

Pumped hydro energy storage is very common type of energy storage being used since a longer time. In 2014, total energy storage capacity by different means was about 184 GW, out of which pumped energy storage has share of 177 GW. Electrochemical (1.5 GW), Thermal storage (3.4 GW) and Electromechanical (2.2 GW) are other storage technologies rallying behind.

Some of the large-scale energy projects (in operation) are tabulated below,

S. No.	Technology	Project name	Location	Size in MW	Duration in HH:MM:SS
1	Pumped Hydro	Bath County Pumped Storage Station	Virginia, United States	3030	10:18:00
2	Pumped Hydro	Huizhou Pumped Storage Power Stn	Guangdong, China	2448	NA
3	Pumped Hydro	Ludington Pumped Storage	Michigan, United State	1872	08:00:00
5	Flywheel	EFDA JET Fusion Flywheel	Abingdon, Oxfordshire, UK	400	00:00:50
6	Flywheel	Max Planck Institute Pulsed Power Supply System	Bavaria, Germany	387	00:00:12
7	Redox Flow Battery Storage	Hokkaido Battery Storage Project	Japan, Hokkaido	60	NA
8	Battery, Lithium iron Phosphate	National Wind and Solar Energy Storage and Transmission Project (I)	China, Hebei, Zhangbei	36	NA
9	CAES	Kraftwerk Huntorf	Große Hellmer 1E, Elsfleth, Germany	321	02:00:00
10	CAES	McIntosh CAES Plant	Alabama, United States	110	26:00:00
11	Molten Salt Thermal Storage	Solana Solar Generating Plant	Gila Bend, Arizona, United States	280	06:00:00

S. No.	Technology	Project name	Location	Size in MW	Duration in HH:MM:SS
12	Molten Salt Thermal Storage	Kaxu Solar One	Pofadder, Northern Cape, South Africa	100	02:30:00

4.7.4 Present Energy Storage System Projects in India

Presently in Indian grid mostly pumped storage hydro plants are installed. Potential available in India for PSHP capacity, assessed by CEA is more than 96.5 GW. However, at present total installed capacity of PSHP is about 4800 MW that consists of nine (9) plants. Additional, two (2) PSHP of 1080 MW capacity are now under construction (Tehri - 1000 MW and Koyna - 80 MW). Also, four (4) PSHPs with cumulative capacity of 2600 MW (Kundah– 500 MW, Malshej Ghat- 700 MW, Humbali- 400 MW, and Turga- 1000 MW) generation are envisaged for development. Out of the nine (9) installed PSHP, only five (5) are in operation, those generates 2600 MW (Srisailam LBPH- 900 MW, Purulia PSS- 900 MW, Kadamparai- 400 MW, Ghatgar- 250 MW, and Bhira- 150 MW) power in total. Rest four (4) installed PSHPs with cumulative generation capacity of 2185.6 MW (Sardar Sarovar- 1200 MW, Nagarjun Sagar- 705.60 MW, Kandana- 240 MW, and Panchet Hill- 40 MW) are not operational. The major reason of non-operation is the absence of tail pool dam and vibration issue.

Currently a grid connected battery energy storage system project is under implementation at Puducherry. Three different technologies; namely, advanced lead acid, lithium ion and NaNiCl2/Alkaline/Flow would be installed under this project. Advanced Lead Acid and Lithium Ion based BESS are designed for 500kW/30min (250kWh) rating and Sodium Nickel Chloride/Alkaline/Flow batteries shall be designed for 250kW/4 hours (1 MWh). All three systems shall be tested mainly for frequency regulation and energy time shift applications to facilitate integration of renewables in future. These BESSs shall be connected to the network through a 22/0.433 kV transformer at Puducherry substation of POWERGRID.

At Talheti, Rajasthan a 1 MW thermal energy storage system is under operation. Two more small scale molten salt storage based projects are under construction in Rajasthan and Gujarat state. A 1,400 kWH Giga-Capacitor based energy storage system is under construction at Hyderabad.

4.7.5 Energy Storage System Road Map

Keeping in view of large scale renewable integration plan and need for establishment of energy storage facility following activities may be taken up on urgent basis:

- Effort to be made to operationalize the 2185.6 MW installed PSHP.
- Expedite the installation of assessed pumped storage hydro capacity, available in India.
- Carry out studies to determine the siting, sizing and type of energy storage system as per location and grid requirement.

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CHAPTER - 5

ANALYSIS & STUDIES FOR 13TH PLAN

5.1 INTRODUCTION

5.1.1 The expanse of the transmission system depends on the load demand it is required to meet and the generation resources. It is essential to have load demand forecast for planning of transmission network. This includes peak demand projections, demand variations over various seasons/months during a year as well as daily variations as the flow on power transmission lines keeps varying based on load- generation scenarios throughout the year.

5.2 PEAK DEMAND PROJECTIONS FOR PERIOD UP TO END OF 13TH PLAN

5.2.1 The 19th Electric Power Survey (19th EPS) which gives of electric demand projections is under finalization. However, the intermediate projections that are available during the exercise of preparation of 19th EPS have been used for transmission planning in this report. Accordingly, the all-India region-wise and state-wise demand assumed for the present studies is given below:

Table – 5.2.1 : 19th EPS Forecast of Annual Peak Load for 13th Plans

YEAR 2021-22	Peak MW	Energy GWH (MU)
Northern Region	78283	496681
Western Region	72349	516451
Southern Region	61058	438855
Eastern Region	30135	196970
North-Eastern Reg.	4592	27018
All India	**232469**	**1676481**
Export:		
Bangladesh	1100	6979
Nepal	600	3808
Total	**234169**	**1687268**

5.2.2 State-wise EPS projections for 13th five-year plan is given in following table.

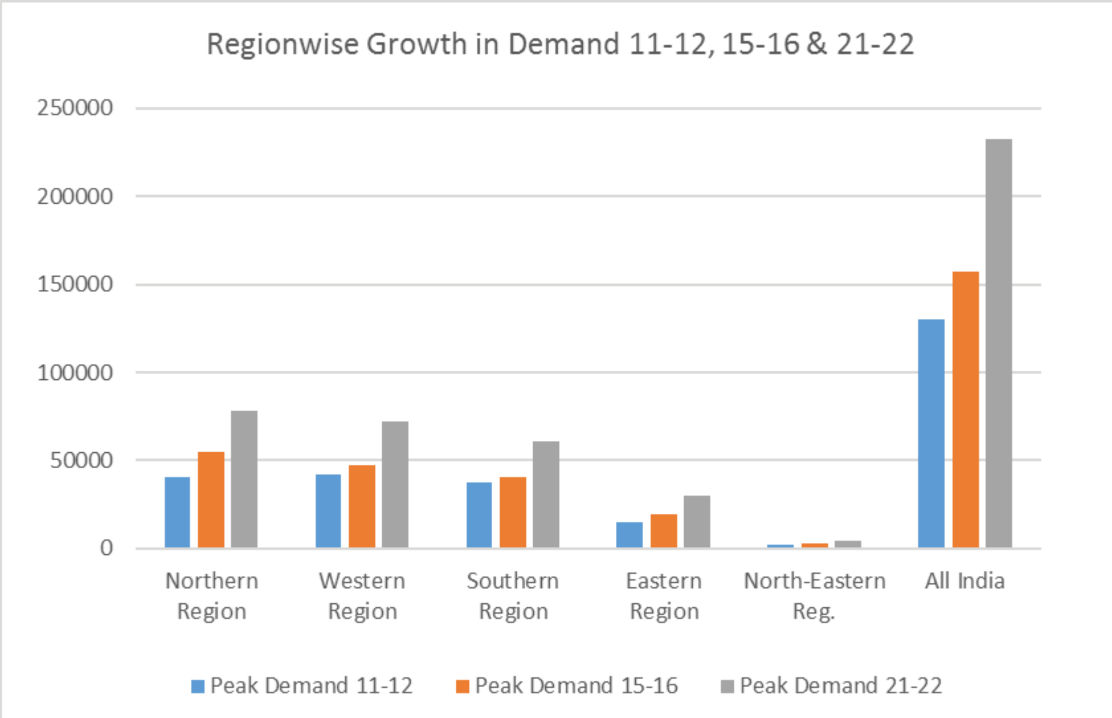
Northern Region		
State	**Peak MW**	**Energy GWH (MU)**
Haryana	13332	68942
Himachal Pradesh	2173	12838
Jammu & Kashmir	4203	26737
Punjab	14996	75323
Rajasthan	16770	103048
Uttar Pradesh	24529	146642
Uttarakhand	3399	21585
Chandigarh	488	2280
Delhi	7787	39286
Total	**78283**	**496681**
Western Region		
State	**Peak MW**	**Energy GWH (MU)**
Gujarat	21529	147367
Madhya Pradesh	17050	97309
Chhattisgarh	5729	36665
Maharashtra	32013	217063
Goa	920	6602
Dadra & Nagar Haveli	461	3211
Daman & Diu	1158	8234
Total	**72349**	**516451**
Southern Region		
State	**Peak MW**	**Energy GWH (MU)**
Andhra Pradesh	11731	79435
Karnataka	14421	90486
Kerala	5472	32076
Tamil Nadu	21773	149887
Telangana	11967	83130
Puducherry	567	3768
Total	**61058**	**438855**
Eastern Region		
State	**Peak MW**	**Energy GWH (MU)**
Bihar	7346	47220
Jharkhand	5360	33657
Odisha	6486	38587
West Bengal	13407	76284
Sikkim	175	789
Total	**30135**	**196970**

North Eastern Region		
State	**Peak MW**	**Energy GWH (MU)**
Assam	2956	17413
Manipur	375	1883
Meghalaya	530	2428
Nagaland	240	1281
Tripura	395	1607
Arunachal Pradesh	298	1333
Mizoram	211	1073
Total	**4592**	**27018**

5.2.3 Region-wise Growth in Demand

For comparison purpose, the region-wise growth trend of Peak Demand since 2011-12 is given below:

Region	Peak Demand in 2011-12, MW	Peak Demand in 2015-16, MW	Peak Demand in 2021-22, MW
Northern Region	40248	54587	78283
Western Region	42352	47717	72349
Southern Region	37599	40793	61058
Eastern Region	14707	19708	30135
North-Eastern Reg.	1920	2640	4592
All India	**130006**	**157567**	**232469**
SAARC (EXPORTS)			
Bangladesh		600	1100
Nepal		200	600
Bhutan		0	0
All India + SAARC	**130006**	**158367**	**234169**



5.3 GROWTH IN PEAK DEMAND – STATE-WISE

For comparison purpose, the state-wise growth trend of Peak Demand since 2011-12 is given below:

Northern Region			
State	**Peak Demand in 2011-12, MW**	**Peak Demand in 2015-16, MW**	**Peak Demand in 2021-22, MW**
Haryana	6553	9151	13332
Himachal Pradesh	1397	1773	2173
Jammu & Kashmir	2385	2498	4203
Punjab	10471	10903	14996
Rajasthan	8188	10991	16770
Uttar Pradesh	12038	17028	24529
Uttarakhand	1612	2092	3399
Chandigarh	263	397	488
Delhi	5031	6304	7787
Total	**40248**	**54587**	**78283**

Western Region			
State	**Peak Demand in 2011-12, MW**	**Peak Demand in 2015-16, MW**	**Peak Demand in 2021-22, MW**
Gujarat	10951	14346	21529
Madhya Pradesh	9151	10934	17050
Chhattisgarh	3239	4009	5729
Maharashtra	21069	21032	32013
Goa	527	581	920
Dadra & Nagar Haveli	615	310	461
Daman & Diu	301	799	1158
Total	**42352**	**47717**	**72349**

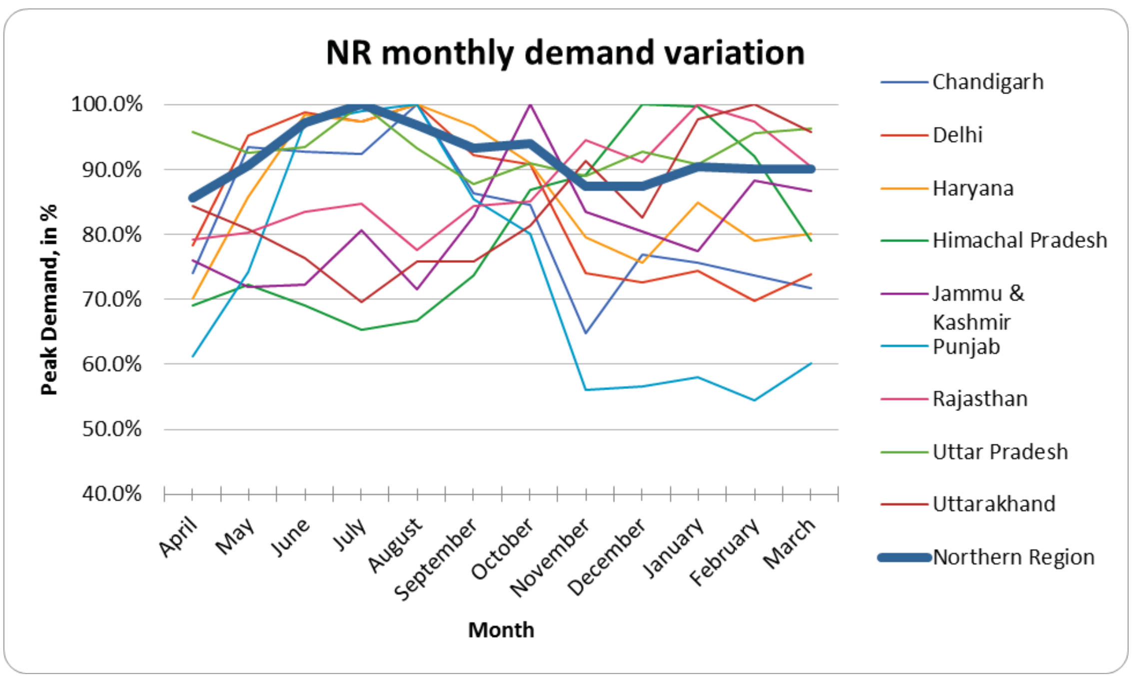
Southern Region			
State	**Peak Demand in 2011-12, MW**	**Peak Demand in 2015-16, MW**	**Peak Demand in 2021-22, MW**
Andhra Pradesh	7027	7507	11731
Karnataka	10545	10348	14421
Kerala	3516	4063	5472
Tamil Nadu	12813	14124	21773
Telangana	7027	7507	11967
Puducherry	335	498	567
Total	**37599**	**40793**	**61058**

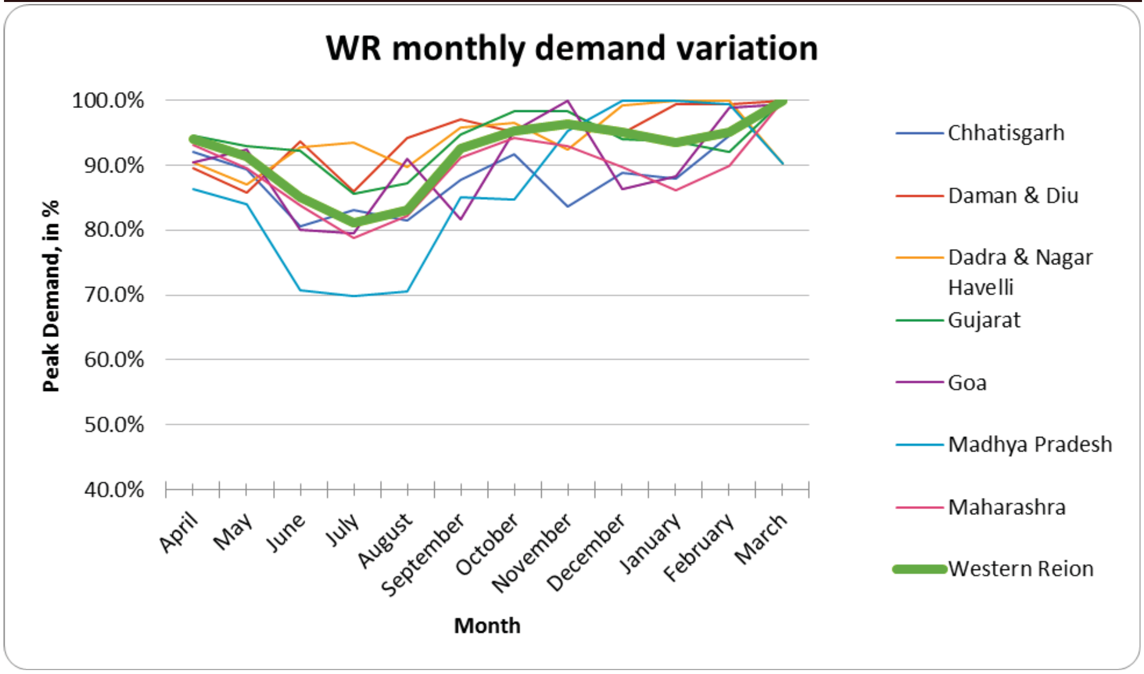
Eastern Region			
State	**Peak Demand in 2011-12, MW**	**Peak Demand in 2015-16, MW**	**Peak Demand in 2021-22, MW**
Bihar	2031	3673	7346
Jharkhand	2346	3547	5360
Odisha	3589	4343	6486
West Bengal	7593	9514	13407
Sikkim	100	157	175
Total	**14707**	**19708**	**30135**

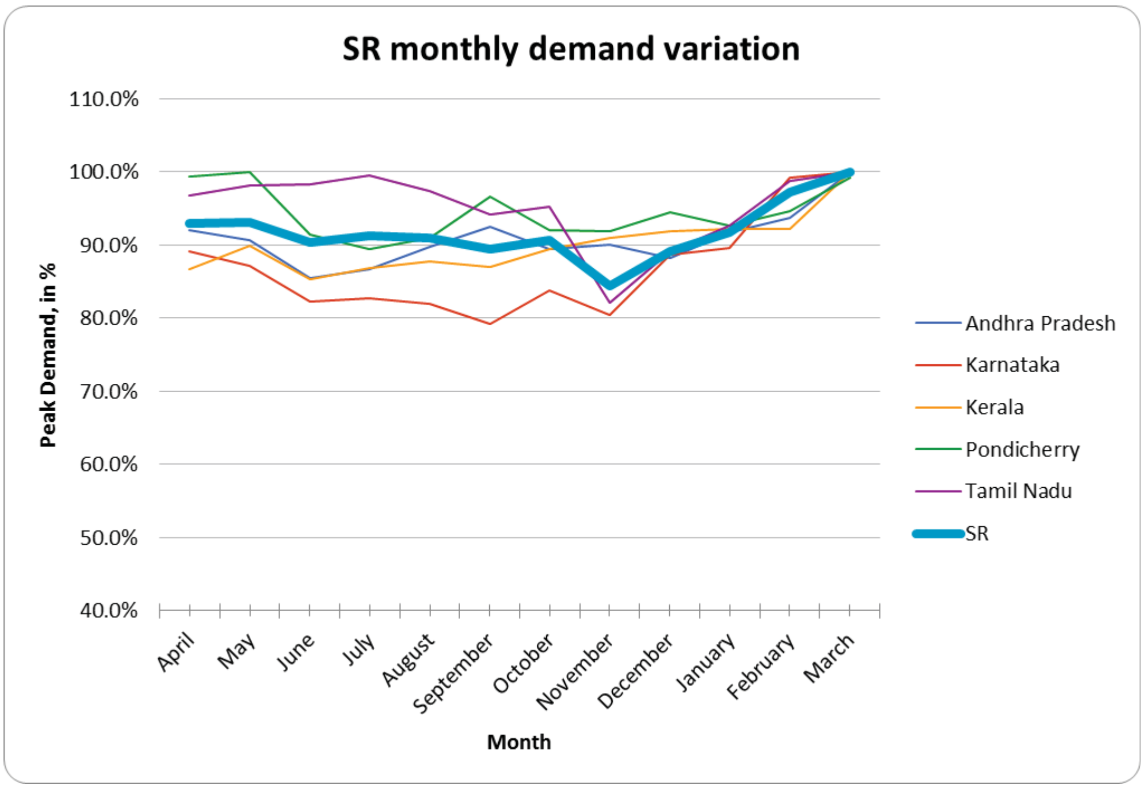
North-Eastern Region			
State	**Peak Demand in 2011-12, MW**	**Peak Demand in 2015-16, MW**	**Peak Demand in 2021-22, MW**
Assam	1112	1481	2956
Manipur	116	169	375
Meghalaya	319	402	530
Nagaland	111	140	240
Tripura	215	309	395
Arunachal Pradesh	121	215	298
Mizoram	82	135	211
Total	**1920**	**2640**	**4592**

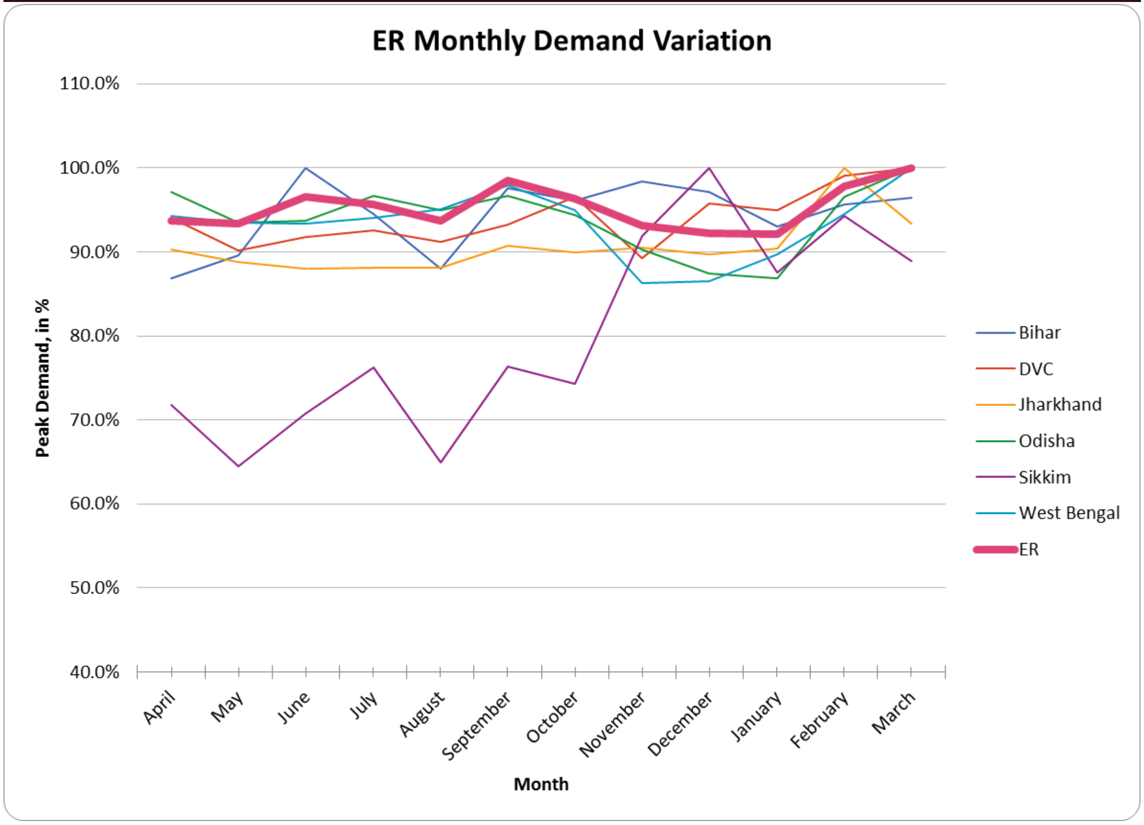
5.4 MONTHLY VARIATION OF PEAK DEMAND

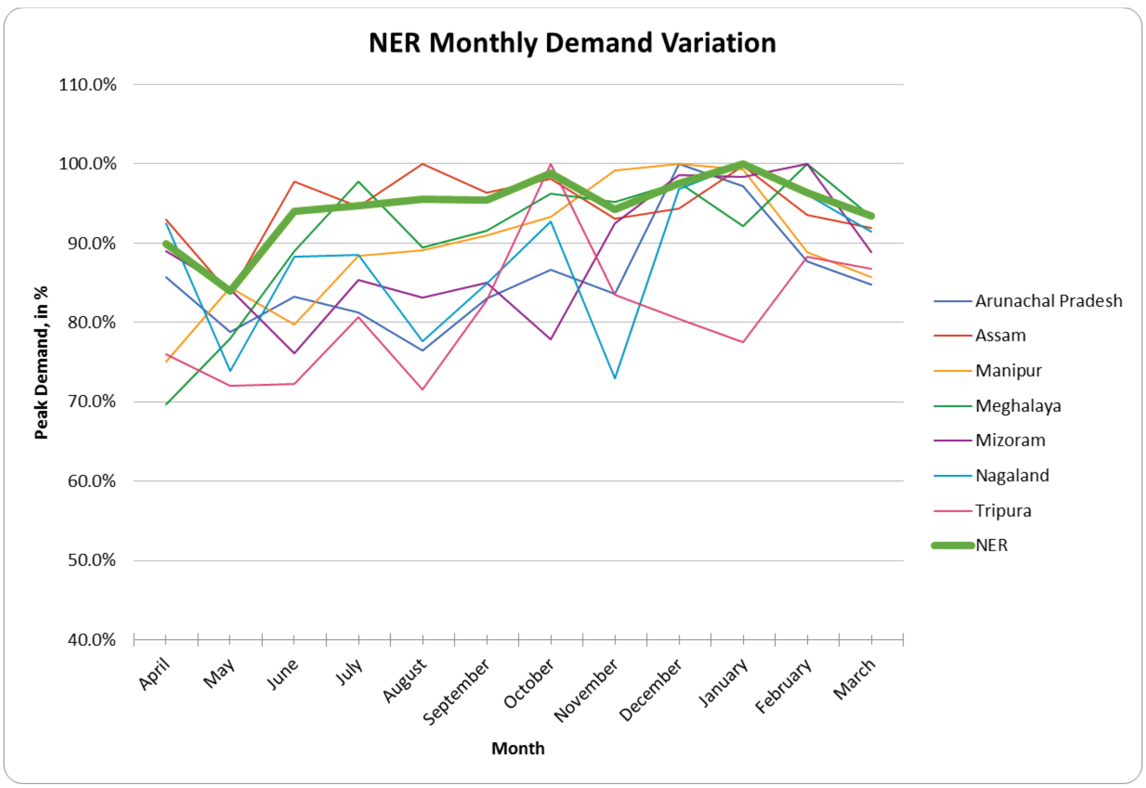
5.4.1 The transmission system is planned to meet the peak load demand. During 8760 hours of the year, the load varies on diurnal, monthly and seasonal basis. In India there are distinct hours of peak (peak load) and off-peak (base load) during a year. The region-wise and state-wise load profile is depicted below:

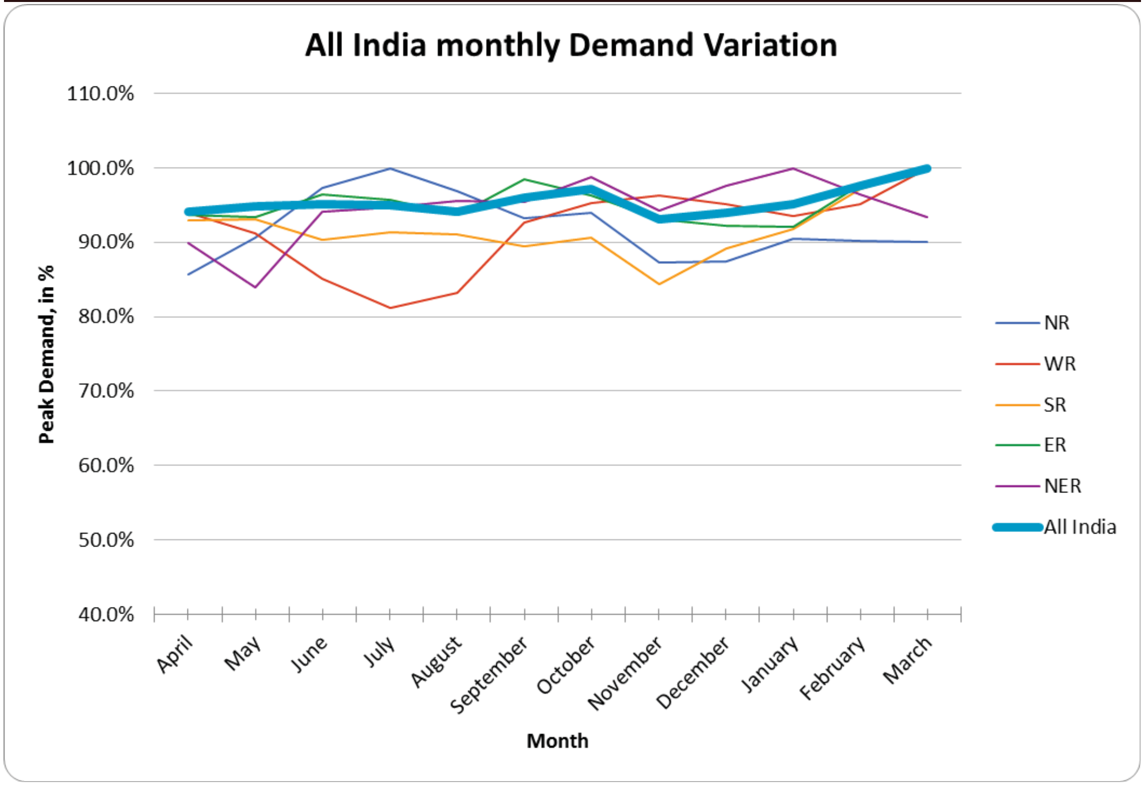



WR monthly demand variation
Peak Demand, in %
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
April
May
June
July
August
September
October
November
December
January
February
March
Month
Chhatisgarh
Daman & Diu
Dadra & Nagar Havelli
Gujarat
Goa
Madhya Pradesh
Maharashra
Western Reion


SR monthly demand variation
Peak Demand, in %
110.0%
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
April
May
June
July
August
September
October
November
December
January
February
March
Month
Andhra Pradesh
Karnataka
Kerala
Pondicherry
Tamil Nadu
SR


ER Monthly Demand Variation
110.0%
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
Peak Demand, in %
April
May
June
July
August
September
October
November
December
January
February
March
Month
Bihar
DVC
Jharkhand
Odisha
Sikkim
West Bengal
ER


NER Monthly Demand Variation
110.0%
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
Peak Demand, in %
April
May
June
July
August
September
October
November
December
January
February
March
Month
Arunachal Pradesh
Assam
Manipur
Meghalaya
Mizoram
Nagaland
Tripura
NER



5.4.2 These load profiles have importance in perspective transmission planning as they help in identifying key load-generation scenarios in which there is maximum stress on the system. These

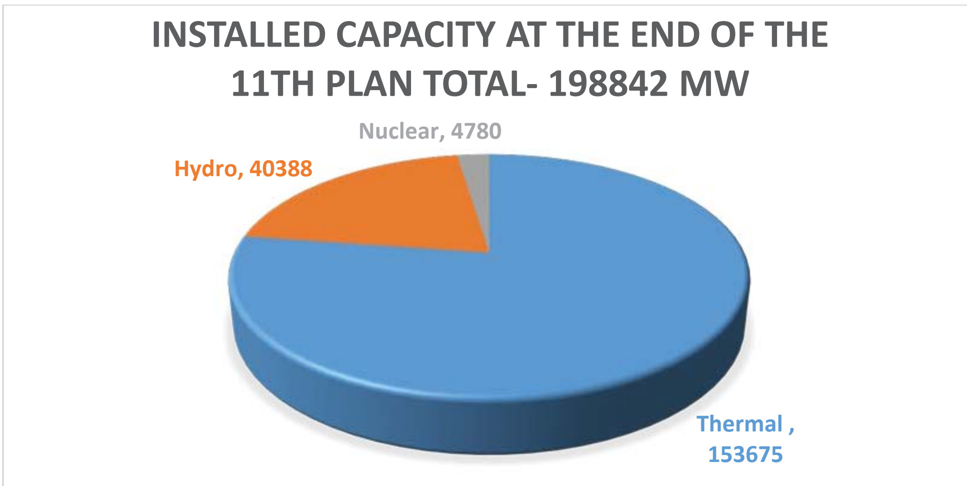
5.5 GENERATION CAPACITY UP TO END OF 13TH PLAN

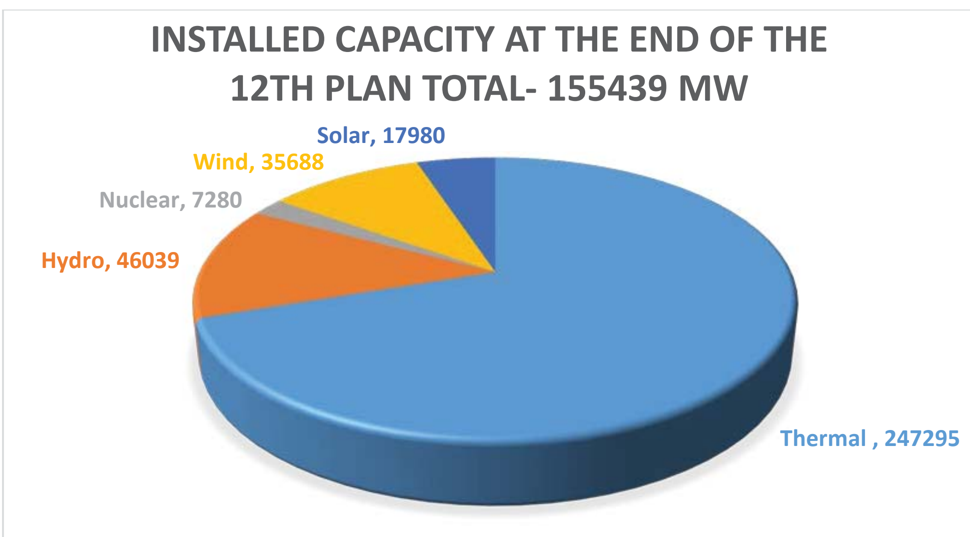
5.5.1 During 12th five-year plan, about 101645 MW of conventional generation capacity addition was envisaged. This was assessed based on the progress and mile-stones achieved by various generation projects that were under implementation. State-wise/region-wise capacity is given in following tables.

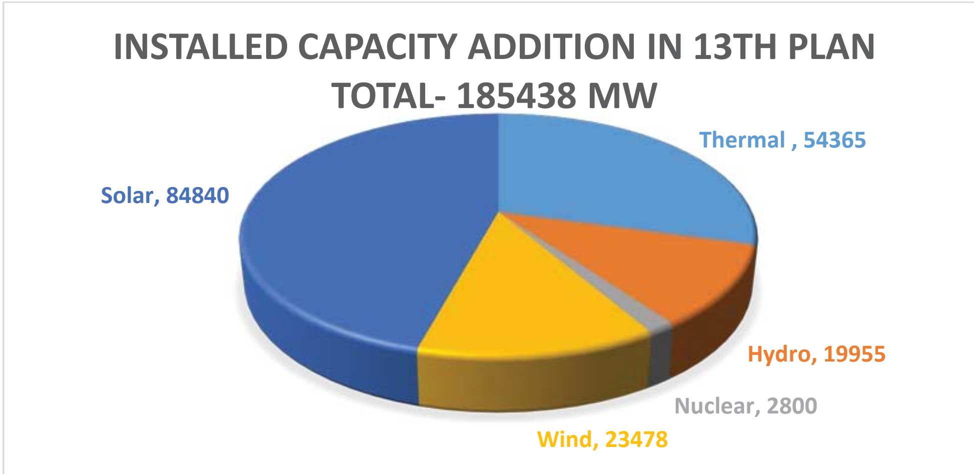
Table – 2.5.1: Region-wise Growth in Generation

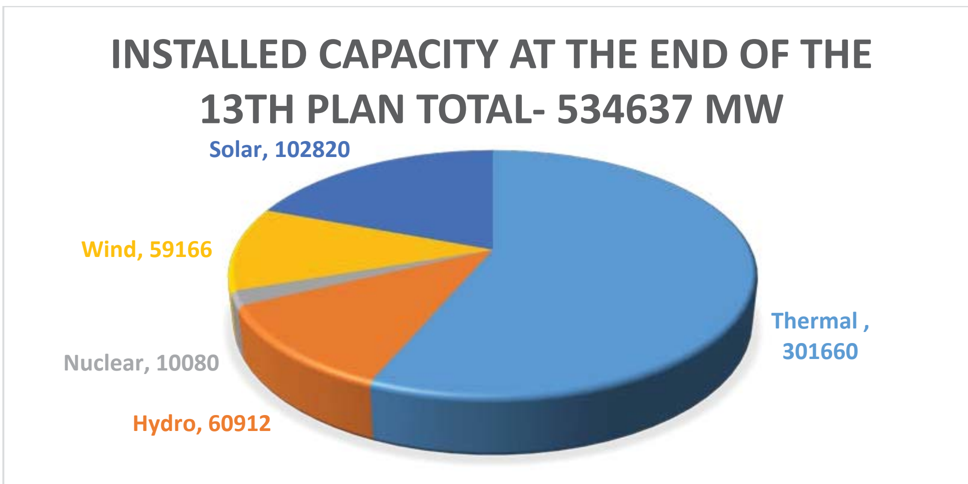
Region	Up to 11th Plan	Addition in 12th Plan	End of 12th Plan	Addition in 13th Plan	Total (End of 13th Plan)
NR	50253	33428	83681	41341	125022
WR	65896	65124	131020	53513	184533
SR	44025	42669	86694	51229	137923
ER	34368	12340	46708	27947	74655

Region	Up to 11th Plan	Addition in 12th Plan	End of 12th Plan	Addition in 13th Plan	Total (End of 13th Plan)
NER	2885	1752	4637	7868	12505
All India	**197426**	**155313**	**352740**	**181898**	**534638**
Bhutan	1416	126	1542	3540	5082
All India + Bhutan	**198842**	**155439**	**354282**	**185438**	**539720**









Tables – 5.5.2 : Generation Capacity Addition during 12th Plan (2012-17)

Capacity Addition during the 12th Plan-Expected						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
			Northern Region			
Haryana	1160	0	0	0	500	1660
Himachal Pradesh	0	2234	0	0	0	2234
Jammu & Kashmir	0	779	0	0	100	879
Punjab	3920	0	0	0	1000	4920
Rajasthan	3720	0	0	6785	4900	15405
Uttar Pradesh	6050	0	0	0	600	6650
Uttarakhand	0	330	0	0	100	430
Delhi	750	0	0	0	500	1250
Total-NR	15600	3343	0	6785	7700	33428

Capacity Addition during the 12th Plan-Expected						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Western Region						
Gujarat	7961	0	0	6349	1780	16090
Madhya Pradesh	11425	0	0	3493	1197	16115
Chhattisgarh	13585	0	0	0	500	14085
Maharashtra	13200	0	0	5135	500	18835
Goa	0	0	0	0	0	0
Total-WR	46171	0	0	14977	3977	65125

Capacity Addition during the 12th Plan-Expected						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Southern Region						
Andhra Pradesh	7540	50	0	2000	1510	11100
Karnataka	3100	0	0	3836	2280	9216
Kerala	0	0	0	0	500	500
Tamil Nadu	7100	60	2500	8090	1403	19153
Telangana	1800	300	0	0	600	2700
Puducherry	0	0	0	0	0	0
Total-SR	19540	410	2500	13926	6293	42669

Capacity Addition during the 12th Plan-Expected						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Eastern Region						
Bihar	2460	0	0	0	0	2460
Jharkhand	1540	0	0	0	0	1540
Odisha	3860	0	0	0	0	3860
West Bengal	3200	292	0	0	0	3492
Sikkim	0	988	0	0	0	988
Andaman Nicobar	0	0	0	0	0	0
UT	0	0	0	0	0	0
Total-ER	11060	1280	0	0	0	12340

Capacity Addition during the 12th Plan-Expected						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
North-Eastern Region						
Assam	350	0	0	0	0	350
Manipur	0	0	0	0	0	0
Meghalaya	0	82	0	0	0	82
Nagaland	0	0	0	0	0	0
Tripura	900	0	0	0	10	910
Arunachal Pradesh	0	410	0	0	0	410
Mizoram	0	0	0	0	0	0
Total-NER	1250	492	0	0	10	1752

Capacity Addition during the 12th Plan-Expected						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
All-India						
Total-NR	15600	3343	0	6785	7700	33428
Total-WR	46171	0	0	14977	3977	65125
Total-SR	19540	410	2500	13926	6293	42669
Total-ER	11060	1280	0	0	0	12340
Total-NER	1250	492	0	0	10	1752
Total All India	**93620**	**5525**	**2500**	**35688**	**17980**	**155313**

5.5.2 Following tables give the generation scenario expected at the end of the 12th Plan.

Table – 5.5.3 : Generation Capacity Expected by end of 12th Plan (2012-17)

Capacity Expected at the end of the 12th Plan						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Northern Region						
Haryana	6412	0	0	0	500	6912
Himachal Pradesh	0	7194	0	0	0	7194
Jammu & Kashmir	175	3119	0	0	100	3394
Punjab	6540	3539	0	0	1000	11079
Rajasthan	10063	411	1180	6785	4900	23339

Capacity Expected at the end of the 12th Plan						
Uttar Pradesh	22126	502	440	0	600	23668
Uttarakhand	0	3696	0	0	100	3796
Delhi	3798	0	0	0	500	4298
Total-NR	49114	18461	1620	6785	7700	83681
Western Region						
Gujarat	25895	1990	440	6349	1780	36454
Madhya Pradesh	17435	2395	0	3493	1197	24520
Chhattisgarh	23818	120	0	0	500	24438
Maharashtra	35638	2887	1400	5135	500	45560
Goa	48	0	0	0	0	48
Total-WR	102834	7392	1840	14977	3977	131020
Southern Region						
Andhra Pradesh	15907	1150	0	2000	1510	20567
Karnataka	8114	3657	880	3836	2280	18768
Kerala	768	1882	0	0	500	3150
Tamil Nadu	18884	2182	2940	8090	1403	33499
Telangana	7283	2796	0	0	600	10679
Puducherry	33	0	0	0	0	33
Total-SR	50988	11667	3820	13926	6293	86694
Eastern Region						
Bihar	8500	0	0	0	0	8500
Jharkhand	7290	273	0	0	0	7563
Odisha	9540	2142	0	0	0	11682
West Bengal	16095	1269	0	0	0	17364
Sikkim	0	1558	0	0	0	1558
Andaman Nicobar	40	0	0	0	0	40
UT	0	0	0	0	0	0
Total-ER	41465	5242	0	0	0	46708
North-Eastern Region						
Assam	977	300	0	0	0	1277
Manipur	36	105	0	0	0	141
Meghalaya	0	439	0	0	0	439
Nagaland	0	75	0	0	0	75
Tripura	1880	0	0	0	10	1890
Arunachal Pradesh	0	815	0	0	0	815
Mizoram	0	0	0	0	0	0
Total-NER	2893	1734	0	0	10	4637
Total All India	**247295**	**44497**	**7280**	**35688**	**17980**	**352740**

5.5.3 Following tables give the generation scenario that may be added in the 13th Plan i.e., by 2021-22.

Table – 5.5.4 : Installed Capacity addition during 13th Plans (All figures are in MW)

Capacity Capacity addition during 13th Plan- Expected/programmed						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Northern Region						
Haryana	0	0	0	0	3642	3642
Himachal Pradesh	0	2435	0	0	1000	3435
Jammu & Kashmir	0	1273	0	0	1055	2328
Punjab	0	206	0	0	3772	3978
Rajasthan	2640	0	1400	584	2000	6624
Uttar Pradesh	4460	0	0	0	10097	14557
Uttarakhand	900	2877	0	0	800	4577
Delhi	0	0	0	0	2200	2200
Total-NR	8000	6791	1400	584	24566	41341
Western Region						
Gujarat	800	0	1400	7700	6990	16890
Madhya Pradesh	4885	400	0	0	4478	9763
Chhattisgarh	5915	0	0	0	1283	7198
Maharashtra	5518	80	0	2300	11406	19304
Goa	0	0	0	0	358	358
Total-WR	17118	480	1400	10000	24515	53513
Southern Region						
Andhra Pradesh	5572	960	0	5910	8324	20766
Karnataka	1600	0	0	1450	3417	6467
Kerala	0	100	0	0	1370	1470
Tamil Nadu	4230	0	0	5234	7481	16945
Telangana	3514.88	120	0	300	1400	5334.88
Puducherry	0	0	0	0	246	246
Total-SR	14916.88	1180	0	12894	22238	51228.88
Eastern Region						
Bihar	6030	0	0	0	2493	8523
Jharkhand	2520	0	0	0	1995	4515
Odisha	4980	0	0	0	2377	7357
West Bengal	300	120	0	0	5336	5756
Sikkim	0	1733	0	0	36	1769
Andaman	0	0	0	0	27	27

Capacity Capacity addition during 13th Plan- Expected/programmed						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Nicobar						
UT	0	0	0	0	805	805
Total-ER	13830	1853	0	0	12264	27947
North-Eastern Region						
Assam	500	0	0	0	663	1163
Manipur	0	0	0	0	105	105
Meghalaya	0	0	0	0	161	161
Nagaland	0	186	0	0	61	247
Tripura	0	0	0	0	95	95
Arunachal Pradesh	0	5865	0	0	100	5965
Mizoram	0	60	0	0	72	132
Total-NER	500	6111	0	0	1759	7868
Total All India	**54365**	**16415**	**2800**	**23478**	**84840**	**181898**

5.5.4 Following tables give the generation scenario that may be available by end of 13th Plan. The total Installed Capacity by the end of 13th Plan is expected to be of the order of 534 GW which also includes about 165 GW of renewable capacity. For the purpose of transmission planning, about 59 GW of wind, 102 GW of Solar and 5 GW of small hydro capacity, for which information was available, has been considered.

Table – 5.5.5 : Installed Capacity at the end of the 13th Plans

(All figures are in MW)

Capacity Expected at the end of the 13th Plan						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Northern Region						
Haryana	6412	0	0	0	4142	10554
Himachal Pradesh	0	9629	0	0	1000	10629
Jammu & Kashmir	175	4392	0	0	1155	5722
Punjab	6540	3745	0	0	4772	15057
Rajasthan	12703	411	2580	7369	6900	29963
Uttar Pradesh	26586	502	440	0	10697	38225
Uttarakhand	900	6573	0	0	900	8373
Delhi	3798	0	0	0	2700	6498

Capacity Expected at the end of the 13th Plan						
State	**Thermal**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**
Total-NR	**57114**	**25252**	**3020**	**7369**	**32266**	**125022**
Western Region						
Gujarat	26695	1990	1840	14049	8770	53344
Madhya Pradesh	22320	2795	0	3493	5675	34283
Chhattisgarh	29733	120	0	0	1783	31636
Maharashtra	41156	2967	1400	7435	11906	64864
Goa	48	0	0	0	358	406
Total-WR	**119952**	**7872**	**3240**	**24977**	**28492**	**184533**
Southern Region						
Andhra Pradesh	21479	2110	0	7910	9834	41333
Karnataka	9714	3657	880	5286	5697	25235
Kerala	768	1982	0	0	1870	4620
Tamil Nadu	23114	2182	2940	13324	8884	50444
Telangana	10797	2916	0	300	2000	16013
Puducherry	33	0	0	0	246	279
Total-SR	**65905**	**12847**	**3820**	**26820**	**28531**	**137923**
Eastern Region						
Bihar	14530	0	0	0	2493	17023
Jharkhand	9810	273	0	0	1995	12078
Odisha	14520	2142	0	0	2377	19039
West Bengal	16395	1389	0	0	5336	23120
Sikkim	0	3291	0	0	36	3327
Andaman Nicobar	40	0	0	0	27	67
UT	0	0	0	0	805	805
Total-ER	**55295**	**7095**	**0**	**0**	**13069**	**75460**
North-Eastern Region						
Assam	1477	300	0	0	663	2440
Manipur	36	105	0	0	105	246
Meghalaya	0	439	0	0	161	600
Nagaland	0	261	0	0	61	322
Tripura	1880	0	0	0	105	1985
Arunachal Pradesh	0	6680	0	0	100	6780
Mizoram	0	60	0	0	72	132
Total-NER	3393	7845	0	0	1267	12505
Total All India	**301660**	**60912**	**10080**	**59166**	**102820**	**534638**

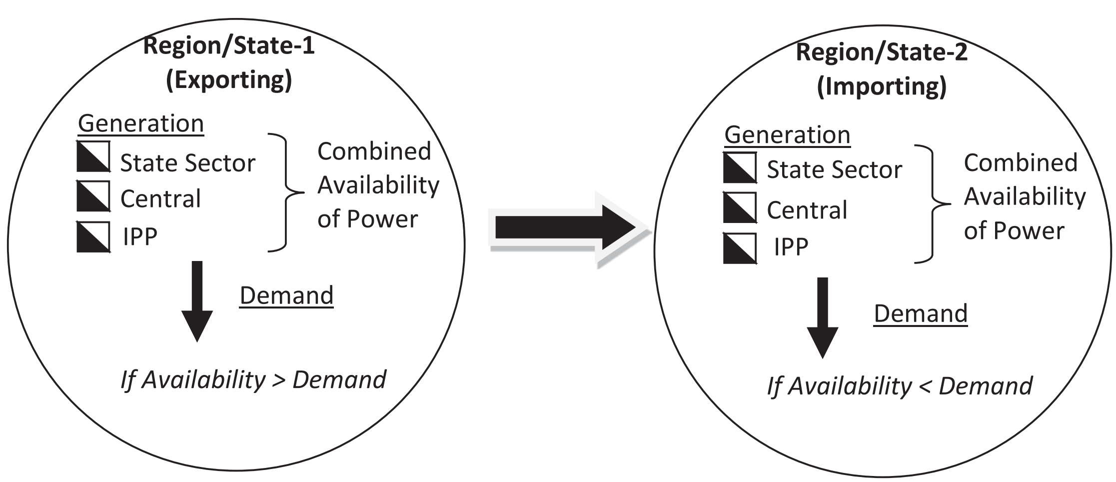
5.5.5 The above generation capacities of about 534 GW would be adequate to meet the annual peak load demand of 232 GW by the end of 13th Plan.

5.6 ASSESSMENT OF TRANSMISSION CAPACITY REQUIREMENT:

The transmission system requirement needs to be evolved at State level which is aggregated on regional level and then at National level. In any given state there can be State sector generation tied up completely to the host state, Central sector generation serving more than one State as well as generating stations belong to State sector and Inter-State IPPs. Further, each State has its own power demand. The net of power availability from all the sources in a State and its demand gives net import or export out of that State. The aggregation of import export requirement of States within a region, and taking into consideration the diversity factor, translates into Inter-regional power transfer requirements. The transmission system is evolved to cater to the inter-state and inter-regional power transfer requirements.

5.7 LOAD GENERATION BALANCE APPROACH:

In order to find out the requirement of transmission system, it is important to find out the surplus/deficit of each Region/State under various conditions which would give the import/export requirement of respective Region/State. For this, the total power available within a Region/State has been considered based on the generation projects physically located in the Region/State irrespective of its classification. Based on the combined availability of power from central sector/State sector/IPP projects in the Region / State as well as the projected demand, the import / export requirement has been worked out as shown below:



5.8 LOAD-GENERATION SCENARIOS AND TRANSMISSION CAPACITY REQUIREMENTS FOR 2021-22

5.8.1 The basic load generation scenario has been worked out subjected to different scenarios corresponding to seasonal/quarterly load & generation variations, variation in despatch due accelerated growth specifically in importing areas etc.

5.8.2 The base Load Generation scenario has been evolved for 4 quarters. The power exchanges with neighbouring SAARC countries considered for 13 plan period include about 5082 MW import from Bhutan and 1100 MW export to Bangladesh. With Nepal, the interconnection would be utilized for both import and export of power and net exchange has been considered as negligible. The region wise installed capacity and peak demand at the end of 13th plan, considering the import and export with the neighbouring SAARC countries is given below.

Table 5.8.1 – All India Installed Capacity and Peak Demand at the end of 13th Plan (2021-22)

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total Gen. I/C	Peak Demand
NR	49973	7141	0	25252	3020	7369	32266	125022	78283
WR	107761	12191	0	7872	3240	24977	28490	184533	72349
SR	55428	9515	963	12847	3820	26821	28531	137923	61058
ER	55085	170	40	7095	0	0	12264	74655	30135
NER	810	2547	36	7845	0	0	1267	12505	4592
All_ India	**269057**	**31565**	**1039**	**60912**	**10080**	**59167**	**102820**	**534637**	**232469**
B'desh	0	0	0	0	0	0	0	0	1100
Nepal	0	0	0	0	0	0	0	0	600
Bhutan	0	0	0	5082	0	0	0	5082	0
All India + SAARC	**269057**	**31565**	**1039**	**65994**	**10080**	**59167**	**102820**	**539719**	**234169**

5.8.3 The Peak Availability Factor for various type of generation types which are also dependent on seasonal/monthly load variations have been considered based on the factors given in new transmission planning criteria. However, due to low availability of Gas and uncertainty of Renewable generation, a low availability factor is taken for Gas and Renewable projects. Accordingly, the load generation balance and correspondingly, **the transmission capacity requirements** for the four quarters are given in **Table 5.8.2 – 5.8.5.**

5.8.4 From these tables, it may be seen that the Northern and Southern region remain in deficit and the other three region have surplus power to feed these deficit regions during peak hours in each quarter. The studies carried out to simulate these scenarios are given in next chapter.

5.8.5 Further to above sensitivity studies considering following additional scenarios were also carried out, which are given at Table 5.8.6 and 5.8.7 for scenarios of higher peak load in Northern and Southern regions, respectively.

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Table 5.8.2 – Transmission Capacity Requirements (in MW) for Q1 – 2021-22

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
Northern	29734	2142	0	12626	2416	1474	0	48392	71836	-23444
Western	64118	3657	0	3936	2592	4995	0	79299	64119	15180
Southern	32979	2855	193	6424	3056	5364	0	50870	53617	-2747
Eastern	32776	51	8	3548	0	0	0	36382	27432	8951
North Eastern	482	764	7	3923	0	0	0	5176	4075	1101
Total	**160089**	**9469**	**208**	**30456**	**8064**	**11833**	**0**	**220119**	**221078**	**-959**
Bangladesh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	2541	0	0	0	2541	0	2541
All India + SAARC	**160089**	**9469**	**208**	**32997**	**8064**	**11833**	**0**	**222660**	**222778**	**-118**

Table 5.8.3 – Transmission Capacity Requirements (in MW) for Q2 – 2021-22

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
Northern	27735	2142	0	17677	2416	1474	0	51444	76639	-25195
Western	59807	3657	0	5510	2592	4995	0	76563	61622	14941
Southern	30762	2855	193	8993	3056	5364	0	51222	51826	-603
Eastern	30572	51	8	4967	0	0	0	35598	29060	6538
North Eastern	450	764	7	5492	0	0	0	6712	4297	2415
Total	**149326**	**9469**	**208**	**42638**	**8064**	**11833**	**0**	**221539**	**223403**	**-1864**
Bangladesh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	3557	0	0	0	3557	0	3557
All India + SAARC	**149326**	**9469**	**208**	**46196**	**8064**	**11833**	**0**	**225096**	**225102.7**	**-6.4105**

Table 5.8.4 – Transmission Capacity Requirements (in MW) for Q3 – 2021-22

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
Northern	31608	2142	0	15151	2416	0	0	51318	71517	-20199
Western	68159	3657	0	4723	2592	0	0	79131	67777	11354
Southern	35058	2855	193	7708	3056	0	0	48869	53792	-4922
Eastern	34841	51	8	4257	0	0	0	39158	28231	10927
North Eastern	512	764	7	4707	0	0	0	5991	4411	1579
Total	**170178**	**9469**	**208**	**36547**	**8064**	**0**	**0**	**224466**	**225727**	**-1261**
Bangladesh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	3049	0	0	0	3049	0	3049
All India + SAARC	**170178**	**9469**	**208**	**39596**	**8064**	**0**	**0**	**227516**	**227427**	**88**

Table 5.8.5 – Transmission Capacity Requirements (in MW) for Q4 – 2021-22

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
Northern	33882	2142	0	12626	2416	0	0	51066	68895	-17829
Western	73062	3657	0	3936	2592	0	0	83247	70396	12852
Southern	37580	2855	193	6424	3056	0	0	50106	59409	-9303
Eastern	37348	51	8	3548	0	0	0	40954	29321	11633
North Eastern	549	764	7	3923	0	0	0	5243	4468	775
Total	**182420**	**9469**	**208**	**30456**	**8064**	**0**	**0**	**230617**	**232469**	**-1852**
Bangladesh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	3557	0	0	0	3557.4	0	3557.4
All India + SAARC	**182420**	**9469**	**208**	**34013**	**8064**	**0**	**0**	**234175**	**234169**	**5.684**

Table 5.8.6 – Transmission Capacity Requirements (in MW) for Q2 – 2021-22: (High NR Demand)

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
Northern	30735	2142	0	17677	2416	1474	0	54444	79639	-25195
Western	59807	3657	0	5510	2592	4995	0	76563	61622	14941
Southern	30762	2855	193	8993	3056	5364	0	51222	51826	-603
Eastern	30572	51	8	4967	0	0	0	35598	29060	6538
North Eastern	450	764	7	5492	0	0	0	6712	4297	2415
Total	**152326**	**9469**	**208**	**42638**	**8064**	**11833**	**0**	**224539**	**226443**	**-1904**
Bangladesh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	3557	0	0	0	3557	0	3557
All India + SAARC	**152326**	**9469**	**208**	**46196**	**8064**	**11833**	**0**	**228096**	**228143**	**-46.716**

Table 5.8.7 – Transmission Capacity Requirements (in MW) for Q4 – 2021-22 : (High SR Demand)

Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
Northern	33882	2142	0	12626	2416	0	0	51066	68895	-17829
Western	73062	3657	0	3936	2592	0	0	83247	70396	12852
Southern	39580	2855	193	6424	3056	0	0	52107	61409	-9302
Eastern	37348	51	8	3548	0	0	0	40954	29321	11633
North Eastern	549	764	7	3923	0	0	0	5243	4468	775
Total	**184420**	**9469**	**208**	**30456**	**8064**	**0**	**0**	**232617**	**234489**	**-1872**
Bangladesh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	3557	0	0	0	3557.4	0	3557.4
All India + SAARC	**184420**	**9469**	**208**	**34013**	**8064**	**0**	**0**	**236175**	**236189**	**-14.161**

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5.9 POWER SYSTEM STUDIES

5.9.1 The adequacy of existing & under construction transmission facilities and requirement of additional transmission system has been assessed based on the power system studies with representation of the power system network of the state as well as inter-state transmission system. The load generation balance scenarios built in the previous sections of this chapter have been represented to simulate different quarters of the year and the transmission system has been evolved to cater to the power transfer requirement under the above conditions. Load Flow studies have been carried out for 13th plan end condition i.e. 2021-22. The existing transmission system and generation projects as well as those planned to come up by 13th plan has been simulated in the study. The transmission system for 400kV and above system has been analysed from the study result. As a first step, the base case analysis was carried out for each Quarter of 2021-22 and then contingency/outage analysis was also carried out considering 'n-2' criteria for the inter-regional links. Further, sensitivity analysis was also performed for crucial corridors along with the contingency studies for reliability.

5.9.2 The study results are represented in terms of the power flow between regions as well as between states in each region. For different conditions the power flows are detailed below.

5.10 Analysis for Base case quarterly load-generation scenarios

5.10.1 Power flow between Regions

From the study results, it is seen that the transmission corridor that are existing, under- construction and planned are able to transfer these power flows among various regions. The details of inter-regional power flow for each of these four quarters are depicted in following figures.

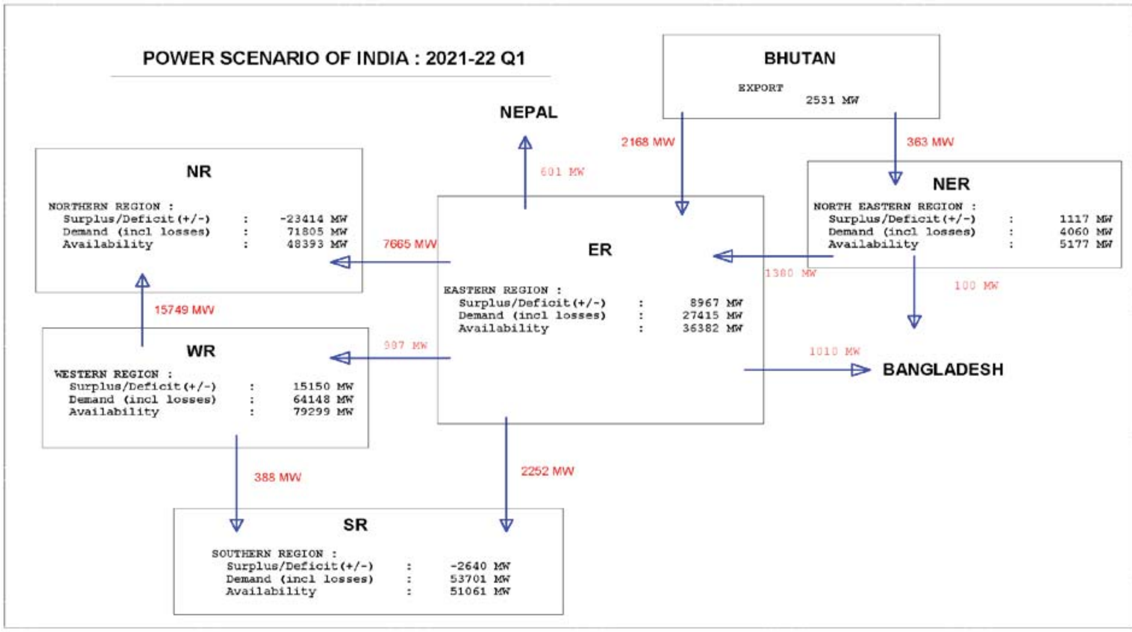


Fig-5.1: Inter-regional power flow during **Quarter – 1 of 2021-22**

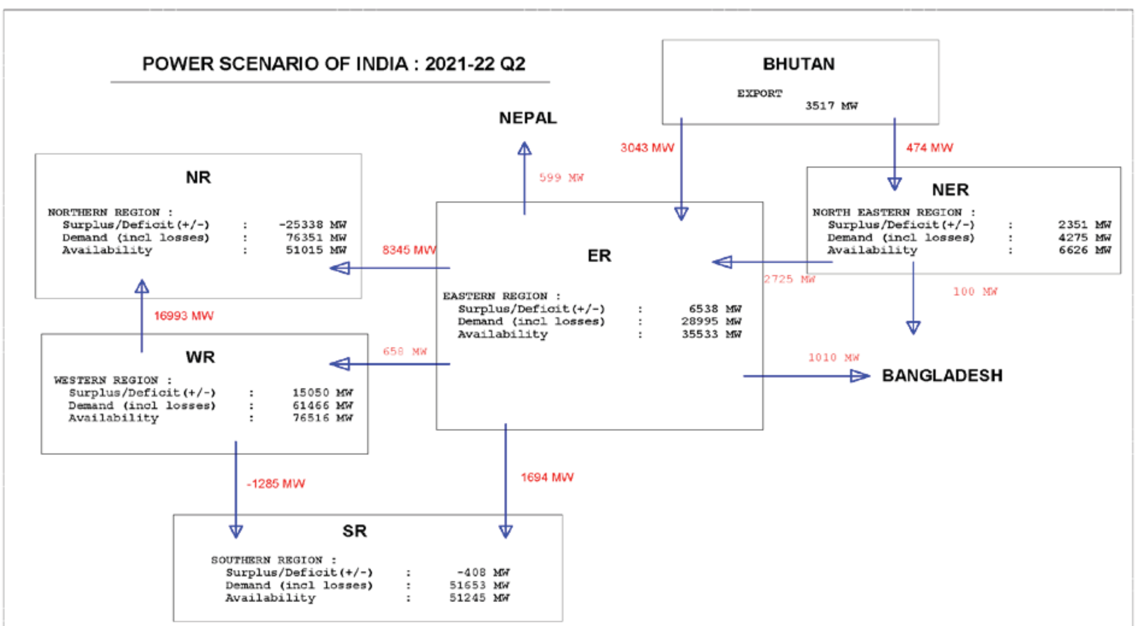


Fig-5.2: Inter-regional power flow during **Quarter – 2 of 2021-22**

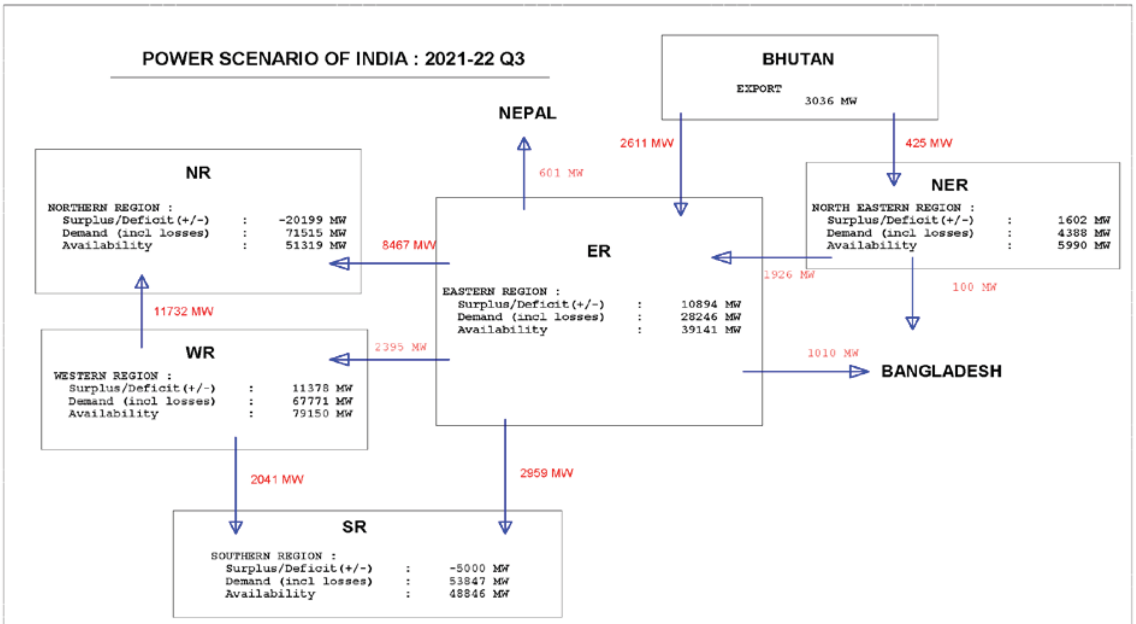


Fig-5.3: Inter-regional power flow during **Quarter – 3 of 2021-22**

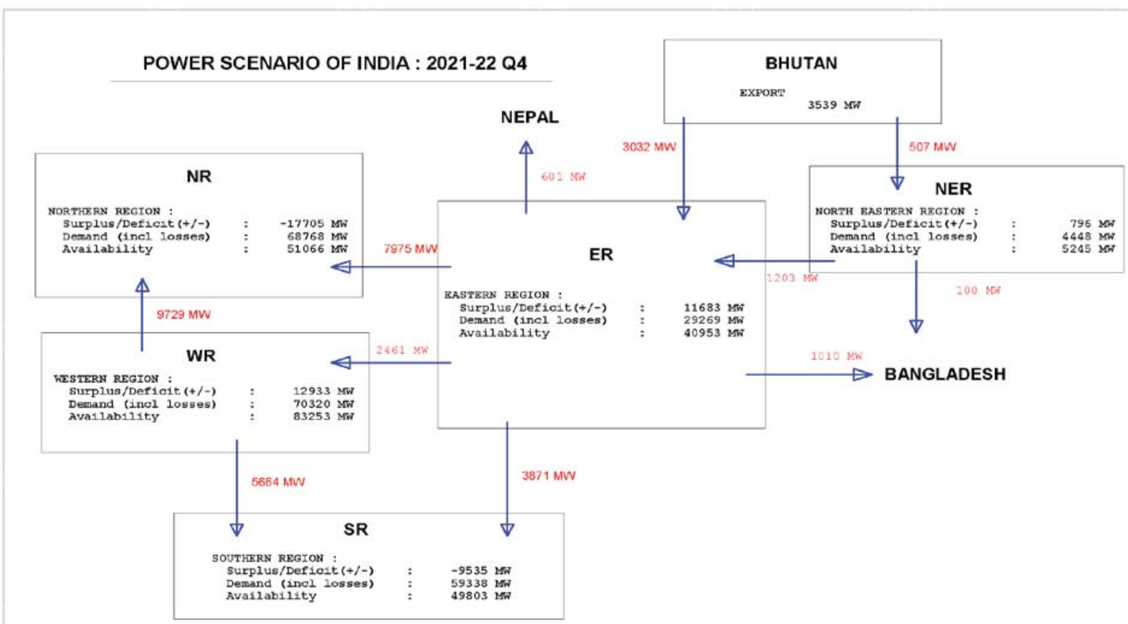


Fig-5.4: Inter-regional power flow during **Quarter – 4 of 2021-22**

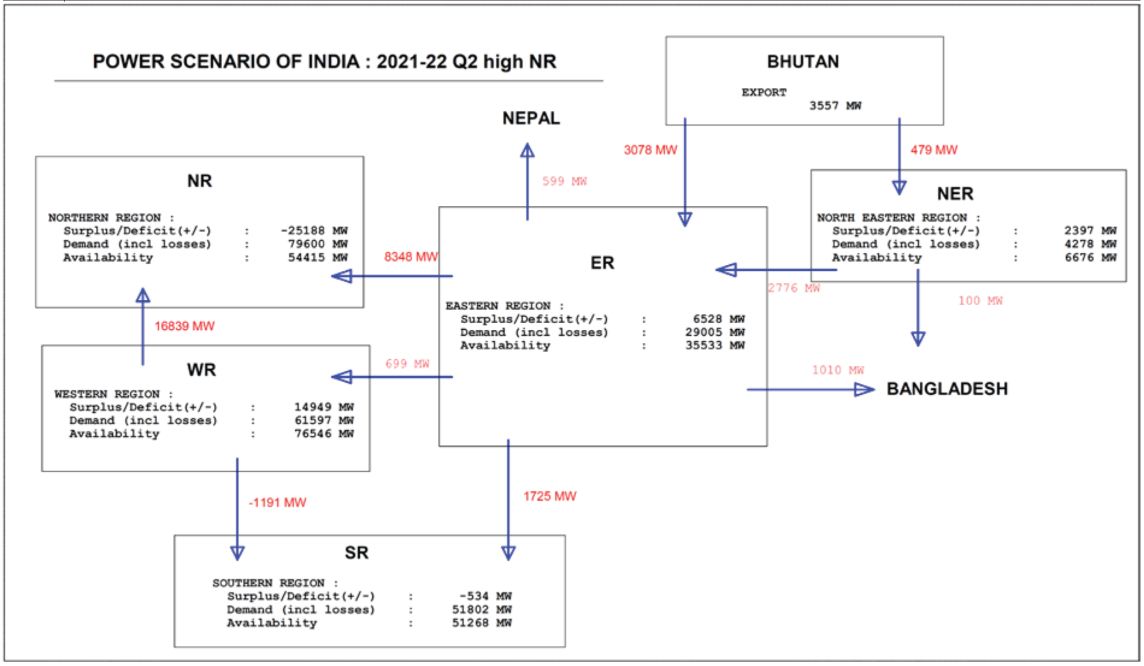


Fig-5.5: Inter-regional power flow during **Quarter – 2 High NR of 2021-22**

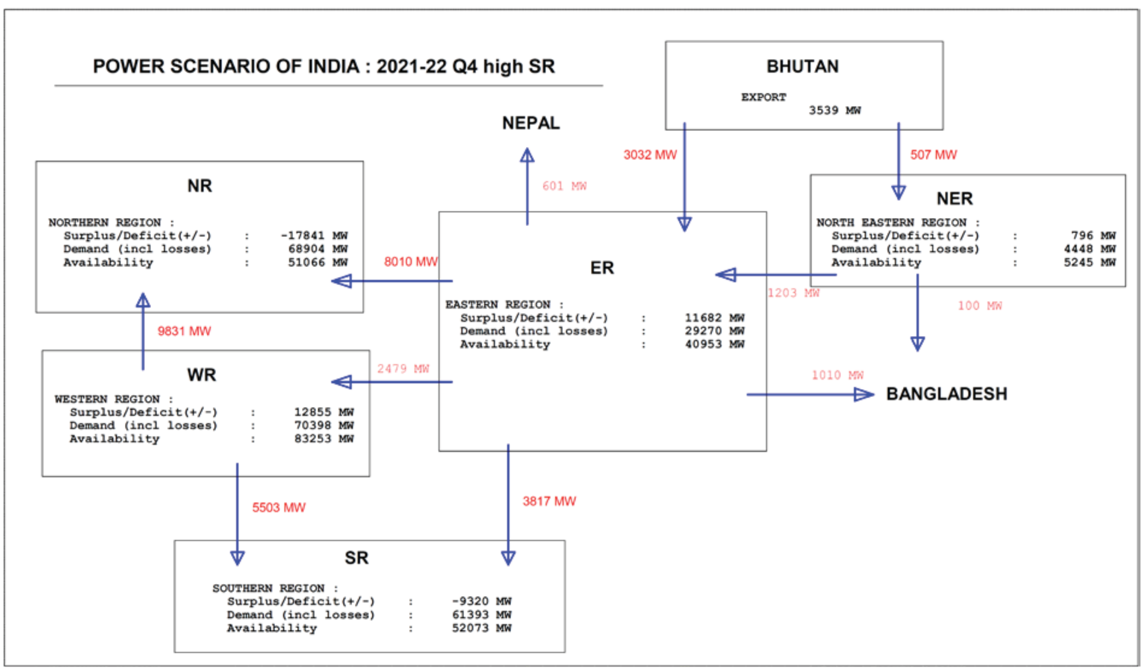


Fig-5.6: Inter-regional power flow during **Quarter – 4 High SR of 2021-22**

5.10.2 Power flow between States (Region wise)

The detailed load flows within each region and among the states in each region and tie-line flows are given at Annexure 5.1 - 5.4 for Q-1, Q-2, Q-3 and Q-4, respectively, as detailed below:

Region/States	Case Studies			
	Q-1	Q-2	Q-3	Q-4
NR States	Annex-5.1a (Q-1)	Annex-5.2a (Q-2)	Annex-5.3a (Q-3)	Annex-5.4a (Q-4)
WR States	Annex-5.1b (Q-1)	Annex-5.2b (Q-2)	Annex-5.3b (Q-3)	Annex-5.4b (Q-4)
SR States	Annex-5.1c (Q-1)	Annex-5.2c (Q-2)	Annex-5.3c (Q-3)	Annex-5.4c (Q-4)
ER States	Annex-5.1d (Q-1)	Annex-5.2d (Q-2)	Annex-5.3d (Q-3)	Annex-5.4d (Q-4)
NER States	Annex-5.1e (Q-1)	Annex-5.2e (Q-2)	Annex-5.3e (Q-3)	Annex-5.4e (Q-4)

5.10.3 Analysis of Power Flow Study results

From system studies, it was observed that the already planned transmission corridors towards SR and NR are sufficient to cater to the assessed import requirement of SR/NR for year 2021-22 under base as well as N-1 contingency conditions. N-2 Contingency analysis was also carried out for critical Inter-regional links, and it was seen that power flow on the existing and planned IR links continues to remain within limits.

However, these studies would need to be repeated after publishing of the 19TH EPS and firm plan for generation addition for period upto 202122.

5.11 Analysis and Studies for Integration of about 160 GW of Wind & Solar

5.11.1 The Power flow studies was shown in annexures above was based on the conventional source of energy without taking renewables into the picture. To integrate the proposed 160 GW of Solar & Wind, cases of Noon-High Wind, Noon-Low Wind and Evening-High Wind were simulated and the corresponding changes in the inter-regional flows were shown in the annexures shown below

Region/States	Case Studies			
	Q-1	**Q-2**	**Q-3**	**Q-4**
Noon High Wind	Annex-5.5a (Q-1)	Annex-5.6a (Q-2)	Annex-5.7a (Q-3)	Annex-5.8a (Q-4)
Noon Low Wind	Annex-5.5b (Q-1)	Annex-5.6b (Q-2)	Annex-5.7b (Q-3)	Annex-5.8b (Q-4)
Evening High Wind	Annex-5.5c (Q-1)	Annex-5.6c (Q-2)	Annex-5.7c (Q-3)	Annex-5.8c (Q-4)

5.11.2 Power System studies cases

102 GW of Solar was taken on All India basis. Out of which 34 GW is solar plants connected to transmission system and are simulated. **The remaining 68 GW are assumed as either rooftop solar generation or small size plants that get connected at DISCOM voltage level, which are simulated as reduction in demand from equivalent demand in respective region.**

1. **Noon- High Wind**

Peak Availability (in MW) for Q1										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	21738	0	0	2525	2416	3685	19360	49724	71836	-22113
WR	46876	0	0	787	2592	12489	17095	79839	64119	15720
SR	24111	0	0	1285	3056	13410	17119	58980	53617	5364
ER	23962	0	0	710	0	0	7358	32030	27432	4598
NER	352	0	0	785	0	0	760	1897	4075	-2178
Total	**117040**	**0**	**0**	**6091**	**8064**	**29583**	**61692**	**222470**	**221078**	**1392**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	508	0	0	0	508	0	508
All India + SAARC	**117040**	**0**	**0**	**6599**	**8064**	**29583**	**61692**	**222978**	**222778**	**200**

Peak Availability (in MW) for Q2										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	21688	0	0	7576	2416	3685	16133	51497	76639	-25142
WR	46768	0	0	2362	2592	12489	14246	78456	61622	16835
SR	24056	0	0	3854	3056	13410	14266	58641	51826	6816
ER	23907	0	0	2129	0	0	6132	32168	29060	3108
NER	352	0	0	2354	0	0	634	3339	4297	-958
Total	**116771**	**0**	**0**	**18274**	**8064**	**29583**	**51410**	**224101**	**223403**	**698**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	1525	0	0	0	1525	0	1525
All India + SAARC	**116771**	**0**	**0**	**19798**	**8064**	**29583**	**51410**	**225626**	**225103**	**523**

Peak Availability (in MW) for Q3										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	27735	0	0	2525	2416	1474	16133	50283	71517	-21234
WR	59807	0	0	787	2592	4995	14246	82428	67777	14651
SR	30762	0	0	1285	3056	5364	14266	54732	53792	941
ER	30572	0	0	710	0	0	6132	37414	28231	9183
NER	450	0	0	785	0	0	634	1868	4411	-2544
Total	**149326**	**0**	**0**	**6091**	**8064**	**11833**	**51410**	**226725**	**225727**	**997**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	508	0	0	0	508	0	508
All India + SAARC	**149326**	**0**	**0**	**6599**	**8064**	**11833**	**51410**	**227233**	**227427**	**-194**

Peak Availability (in MW) for Q4										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	28984	0	0	2525	2416	1474	16133	51532	68895	-17363
WR	62501	0	0	787	2592	4995	14246	85122	70396	14726
SR	32148	0	0	1285	3056	5364	14266	56118	59409	-3291
ER	31949	0	0	710	0	0	6132	38791	29321	9469
NER	470	0	0	785	0	0	634	1888	4468	-2580
Total	**156053**	**0**	**0**	**6091**	**8064**	**11833**	**51410**	**233451**	**232469**	**982**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	508	0	0	0	508	0	508
All India + SAARC	**156053**	**0**	**0**	**6599**	**8064**	**11833**	**51410**	**233959**	**234169**	**-210**

2. Noon-Low Wind

Peak Availability (in MW) for Q1										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	26086	0	0	2525	2416	737	19360	51124	71836	-20713
WR	56251	0	0	787	2592	2498	17095	79223	64119	15105
SR	28933	0	0	1285	3056	2682	17119	53074	53617	-542
ER	28754	0	0	710	0	0	7358	36822	27432	9391
NER	423	0	0	785	0	0	760	1968	4075	-2107
Total	**140447**	**0**	**0**	**6091**	**8064**	**5917**	**61692**	**222211**	**221078**	**1133**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	508	0	0	0	508	0	508
All India + SAARC	**140447**	**0**	**0**	**6599**	**8064**	**5917**	**61692**	**222719**	**222778**	**-59**

Peak Availability (in MW) for Q2										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	25986	0	0	7576	2416	737	16133	52848	76639	-23792
WR	56036	0	0	2362	2592	2498	14246	77733	61622	16111
SR	28822	0	0	3854	3056	2682	14266	52680	51826	854
ER	28644	0	0	2129	0	0	6132	36905	29060	7845
NER	421	0	0	2354	0	0	634	3408	4297	-889
Total	**139909**	**0**	**0**	**18274**	**8064**	**5917**	**51410**	**223573**	**223402**	**170**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	1525	0	0	0	1525	0	1525
All India + SAARC	**139909**	**0**	**0**	**19798**	**8064**	**5916**	**51410**	**225098**	**225102**	**-5**

Peak Availability (in MW) for Q3										
Region	**Coal**	**Gas**	**DG**	**Hydro**	**Nuclear**	**Wind**	**Solar**	**Total**	**Demand**	**Surplus/ Deficit**
NR	29984	0	0	2525	2416	0	16133	51058	71517	-20459
WR	64657	0	0	787	2592	0	14246	82282	67777	14505
SR	33257	0	0	1285	3056	0	14266	51863	53792	-1929
ER	33051	0	0	710	0	0	6132	39893	28231	11662
NER	486	0	0	785	0	0	634	1904	4411	-2507
Total	**161434**	**0**	**0**	**6091**	**8064**	**0**	**51410**	**226999**	**225727**	**1272**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	508.2	0	0	0	508.2	0	508.2
All India + SAARC	**161433**	**0**	**0**	**6599**	**8064**	**0**	**51410**	**227507**	**227427**	**80**

Peak Availability (in MW) for Q4										
Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
NR	31233	0	0	2525	2416	0	16133	52307	68895	-16588
WR	67351	0	0	787	2592	0	14246	84976	70396	14580
SR	34642	0	0	1285	3056	0	14266	53248	59409	-6161
ER	34428	0	0	710	0	0	6132	41270	29321	11948
NER	506	0	0	785	0	0	634	1924	4468	-2544
Total	**168160**	**0**	**0**	**6091**	**8064**	**0**	**51410**	**233725**	**232469**	**1256**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	508	0	0	0	508	0	508
All India + SAARC	**168160**	**0**	**0**	**6599**	**8064**	**0**	**51410**	**234234**	**234169**	**65**

3. Evening High Wind

Peak Availability (in MW) for Q1										
Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
NR	28385	0	0	10101	2416	4421	0	45323	71836	-26513
WR	61208	0	0	3149	2592	14986	0	81935	64119	17817
SR	31483	0	0	5139	3056	16092	0	55770	53617	2153
ER	31288	0	0	2838	0	0	0	34126	27432	6695
NER	460	0	0	3138	0	0	0	3598	4075	-477
Total	**152824**	**0**	**0**	**24365**	**8064**	**35500**	**0**	**220752**	**221078**	**-326**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	2033	0	0	0	2033	0	2033
All India + SAARC	**152824**	**0**	**0**	**26398**	**8064**	**35500**	**0**	**222785**	**222778**	**7**

Peak Availability (in MW) for Q2										
Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus /Deficit
NR	26386	0	0	15151	2416	4421	0	48375	76639	-28265
WR	56898	0	0	4723	2592	14986	0	79199	61622	17577
SR	29266	0	0	7708	3056	16092	0	56122	51826	4296
ER	29085	0	0	4257	0	0	0	33342	29060	4283
NER	428	0	0	4707	0	0	0	5135	4297	838
Total	**142062**	**0**	**0**	**36547**	**8064**	**35500**	**0**	**222173**	**223403**	**-1230**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	3049	0	0	0	3049	0	3049
All India + SAARC	**142062**	**0**	**0**	**39596**	**8064**	**35500**	**0**	**225222**	**225103**	**119**

Peak Availability (in MW) for Q3										
Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
NR	30234	0	0	12626	2416	2948	0	48223	71517	-23293
WR	65195	0	0	3936	2592	9991	0	81714	67777	13937
SR	33534	0	0	6424	3056	10728	0	53741	53792	-50
ER	33326	0	0	3548	0	0	0	36874	28231	8643
NER	490	0	0	3923	0	0	0	4413	4411	1
Total	**162779**	**0**	**0**	**30456**	**8064**	**23666**	**0**	**224965**	**225727**	**-762**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	2541	0	0	0	2541	0	2541
All India + SAARC	**162779**	**0**	**0**	**32997**	**8064**	**23666**	**0**	**227506**	**227427**	**79**

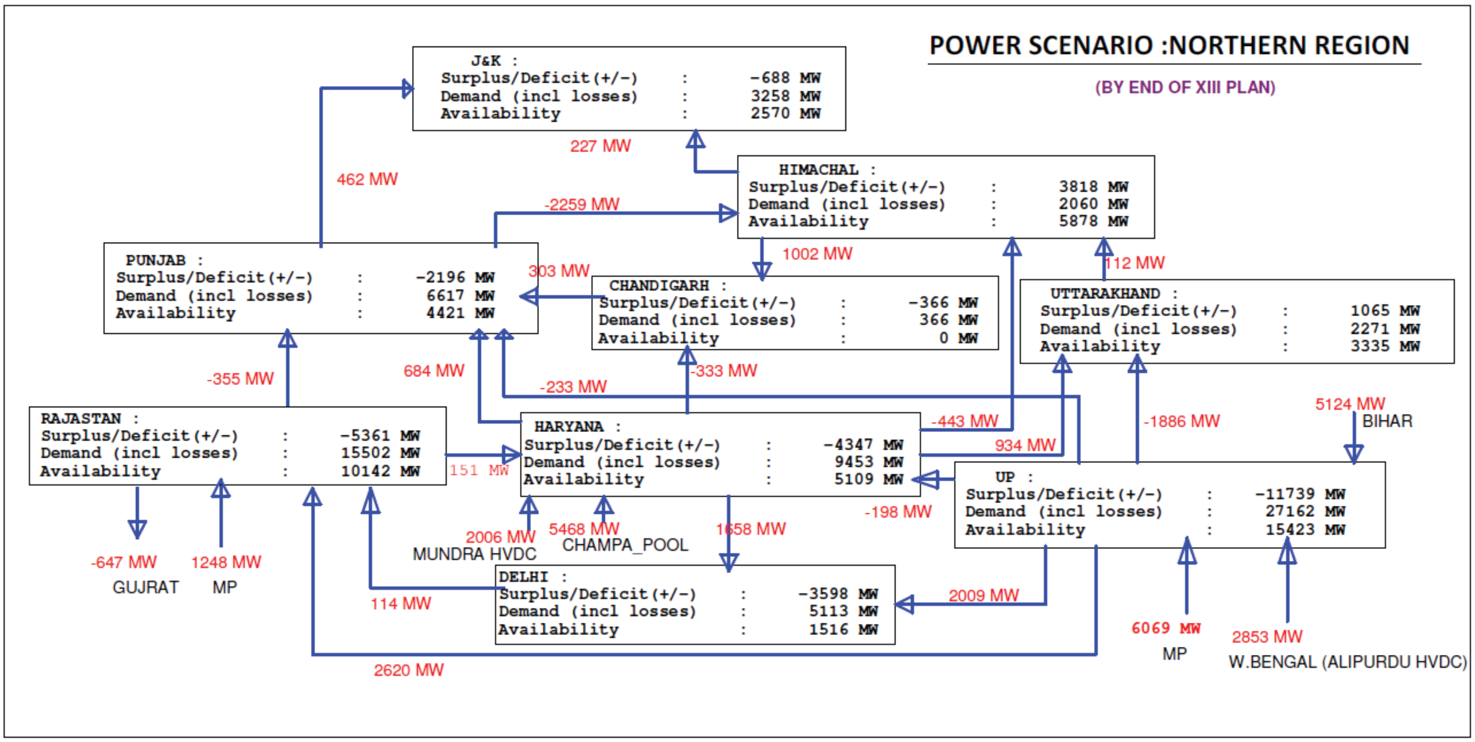
Peak Availability (in MW) for Q4										
Region	Coal	Gas	DG	Hydro	Nuclear	Wind	Solar	Total	Demand	Surplus/ Deficit
NR	32682	0	0	10101	2416	2948	0	48147	68895	-20748
WR	70476	0	0	3149	2592	9991	0	86207	70396	15812
SR	36250	0	0	5139	3056	10728	0	55172	59409	-4237
ER	36026	0	0	2838	0	0	0	38864	29321	9542
NER	530	0	0	3138	0	0	0	3668	4468	-800
Total	**175963**	**0**	**0**	**24365**	**8064**	**23666**	**0**	**232058**	**232469**	**-411**
B'desh	0	0	0	0	0	0	0	0	1100	-1100
Nepal	0	0	0	0	0	0	0	0	600	-600
Bhutan	0	0	0	2033	0	0	0	2032.8	0	2033
All India + SAARC	**175963**	**0**	**0**	**26398**	**8064**	**23666**	**0**	**234091**	**234169**	**-78**

5.12 Analysis of Power Flow Study results for Integration of RES

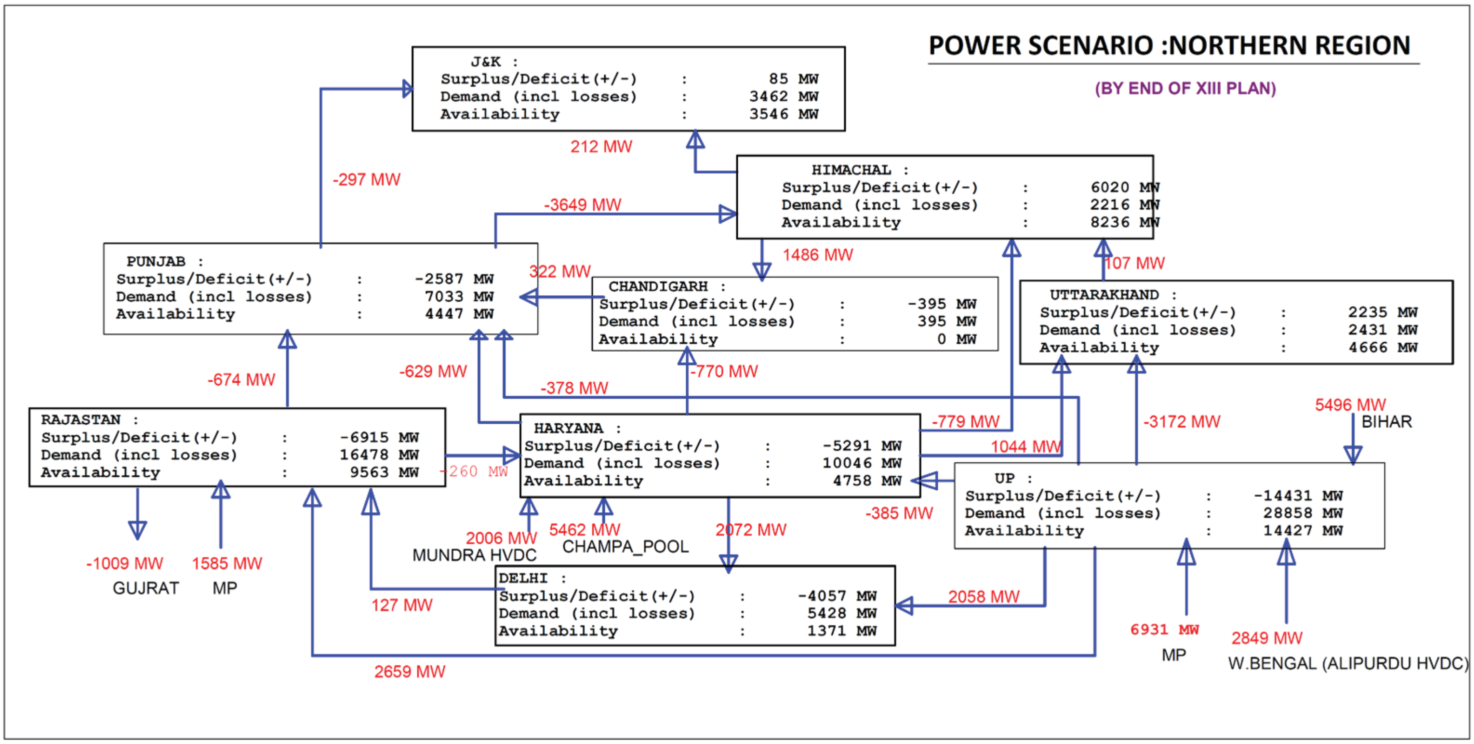
From system studies, it was observed that the already planned transmission corridors between various regions is sufficient to cater to variable dispatches wind and solar during both evening peak and noon time(when solar dispatches are high), provided the gas generation is reduced to zero and coal based generation are also brought down as shown under various scenarios. In this analysis, it is assumed that, the all-India peak dispatch from wind would be 50% of the wind installed capacity due to spatial diversity. It is also assumed that the all-India dispatch from solar plats would be 60% of the installed capacity during summer months and 50% during rest of the months.

----*----*----*----

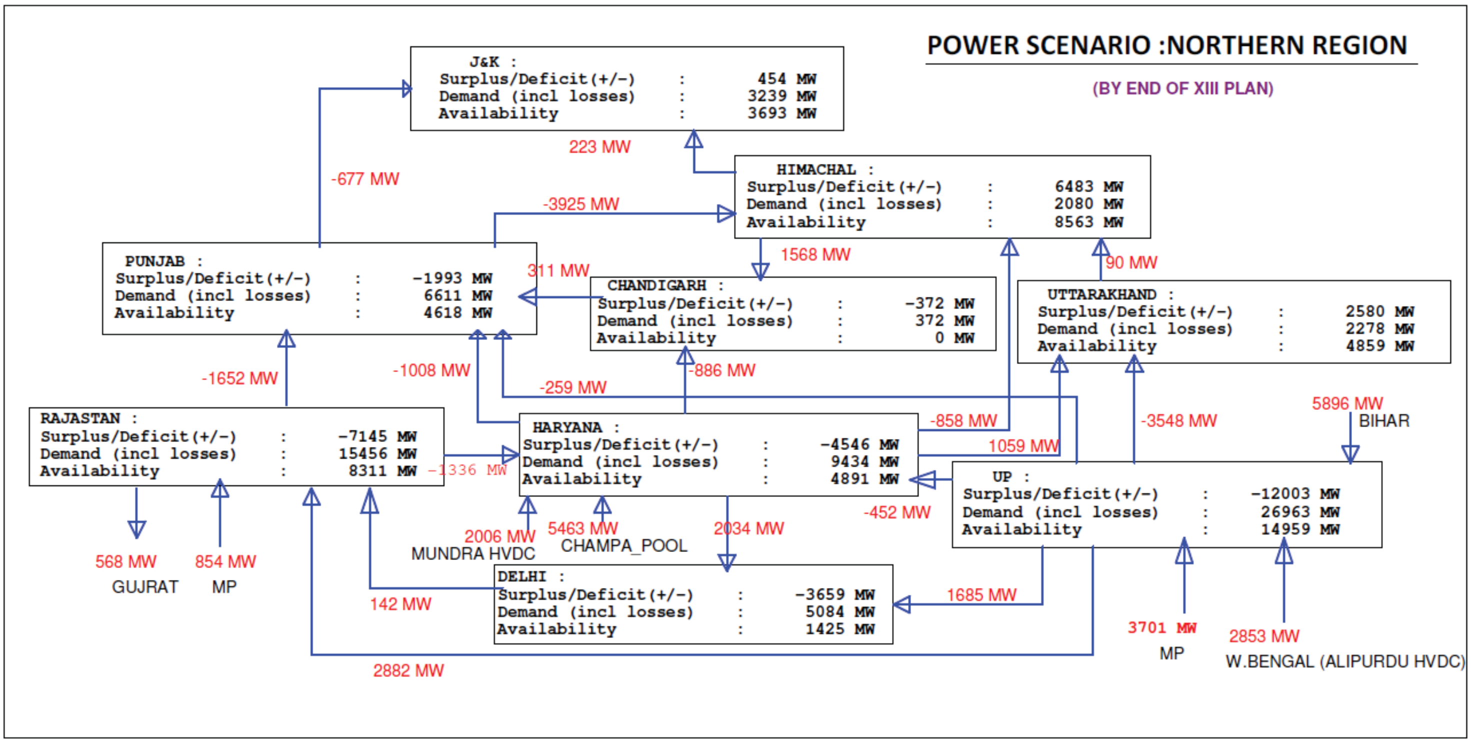
Q1 (NR) ANNEX : 5.1a



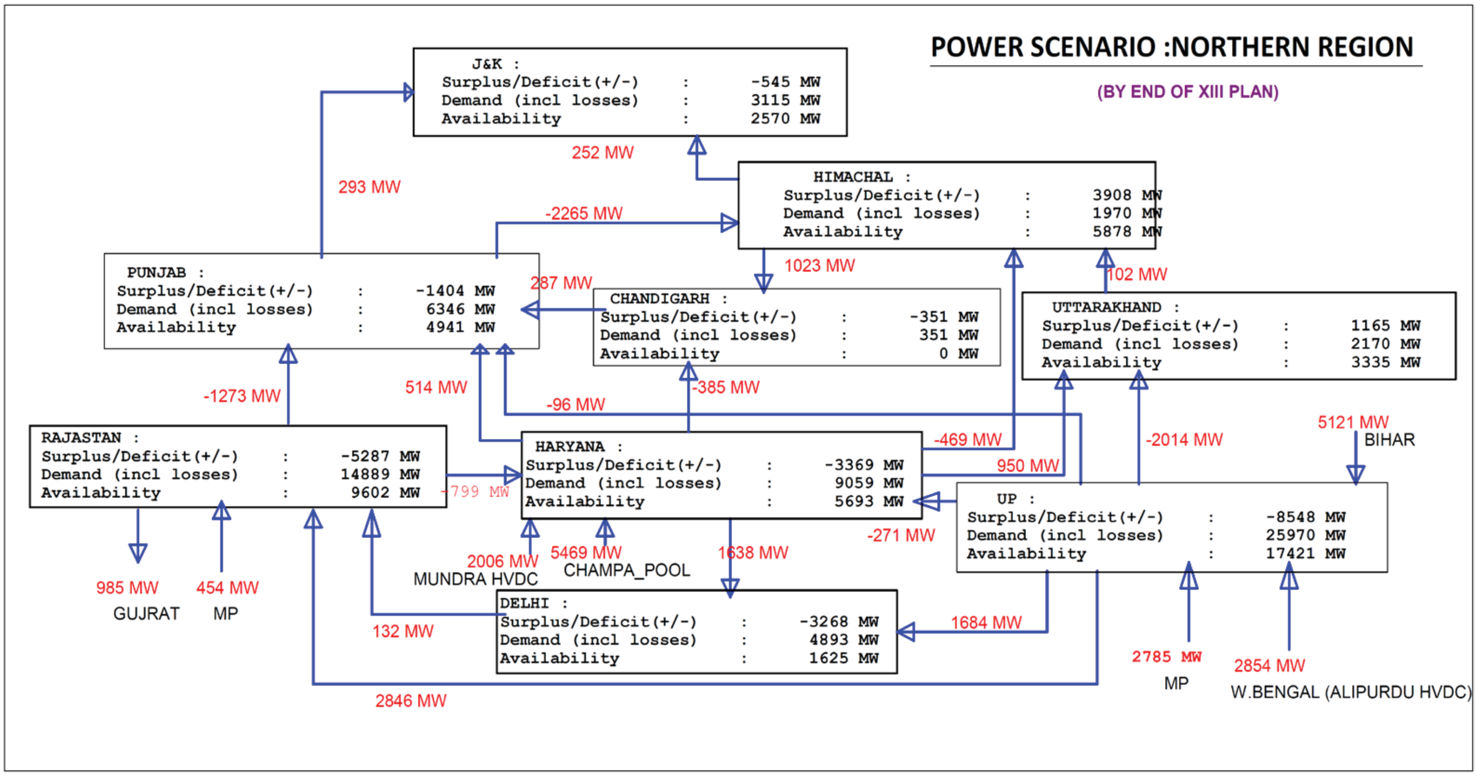
Q2 (NR) ANNEX: 5.2a



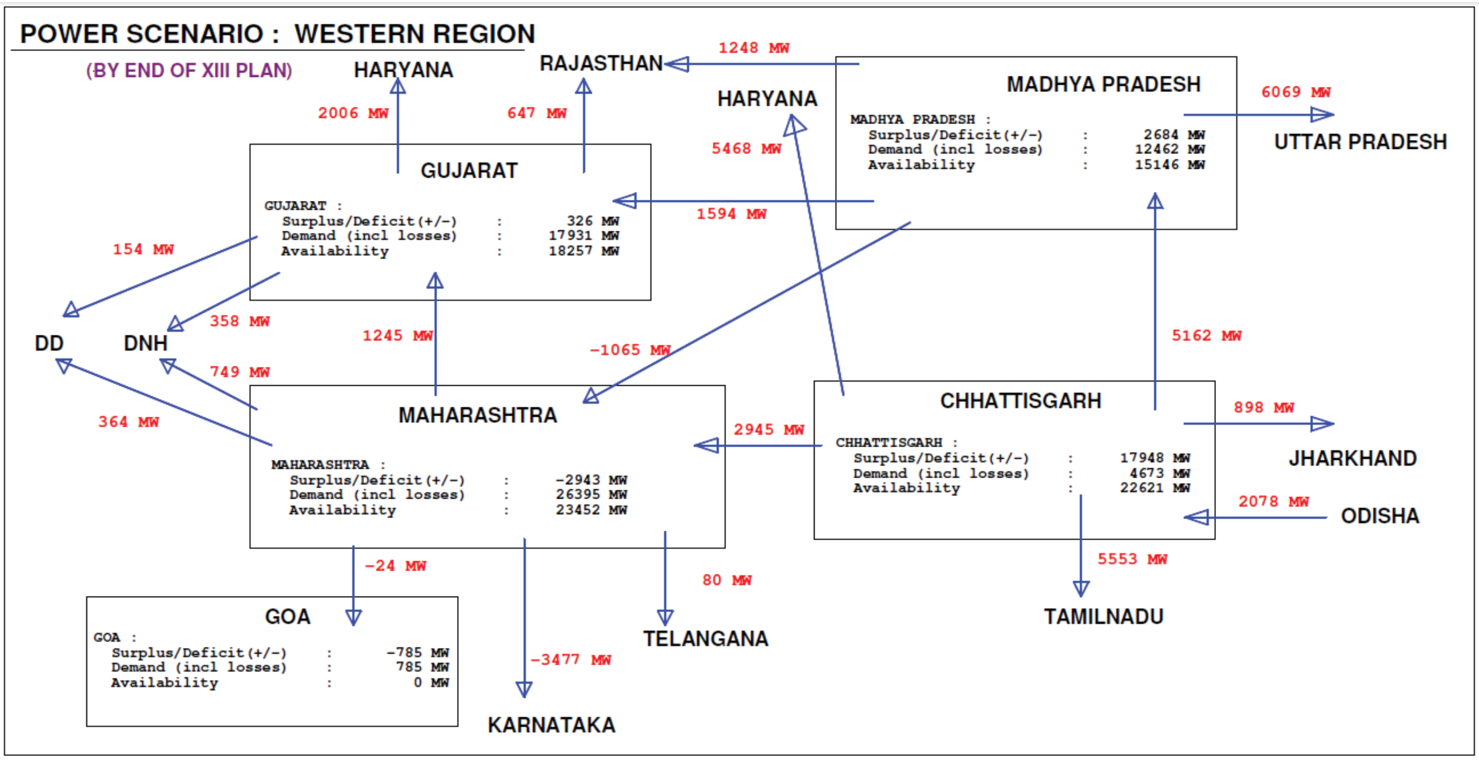
Q3 (NR) ANNEX: 5.3a



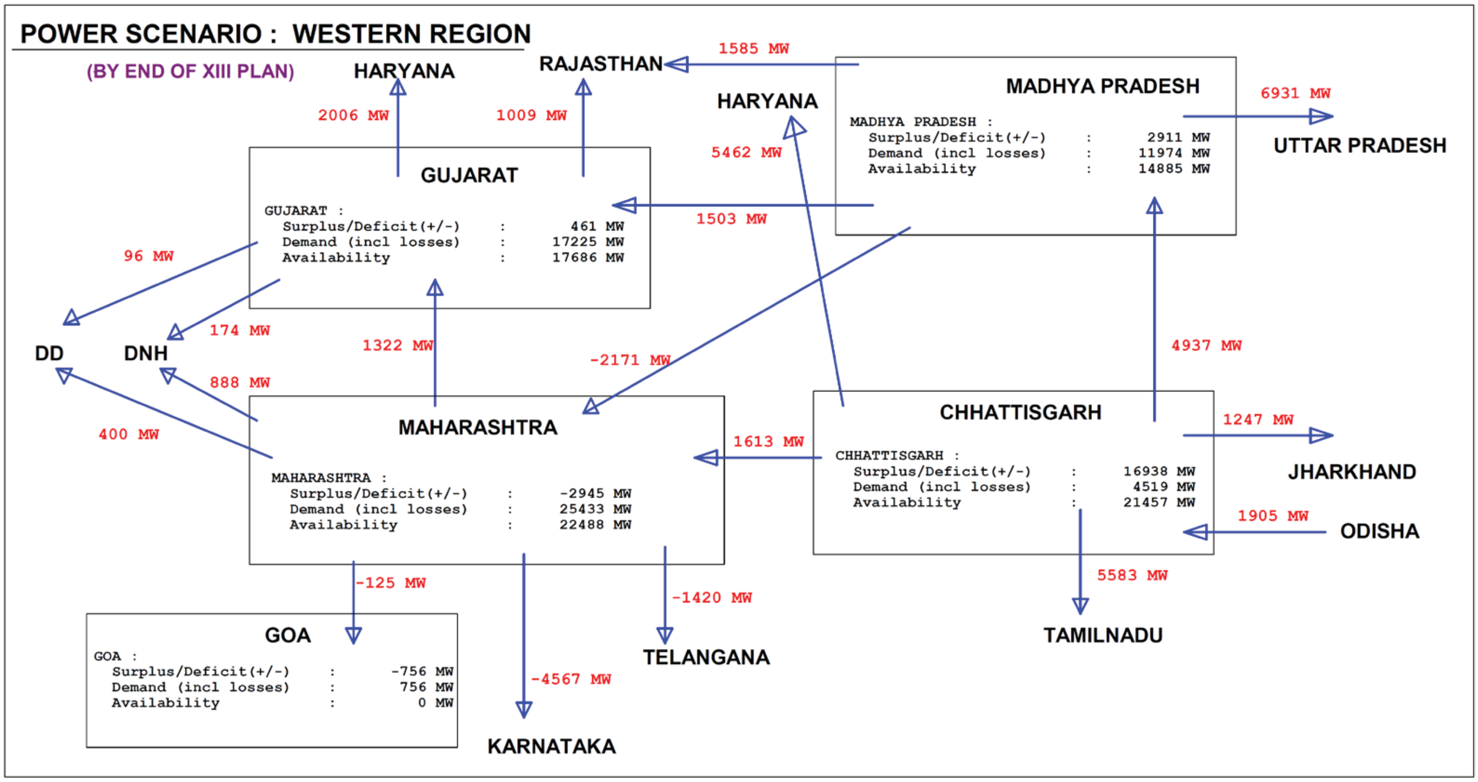
Q4 (NR) **ANNEX: 5.4a**



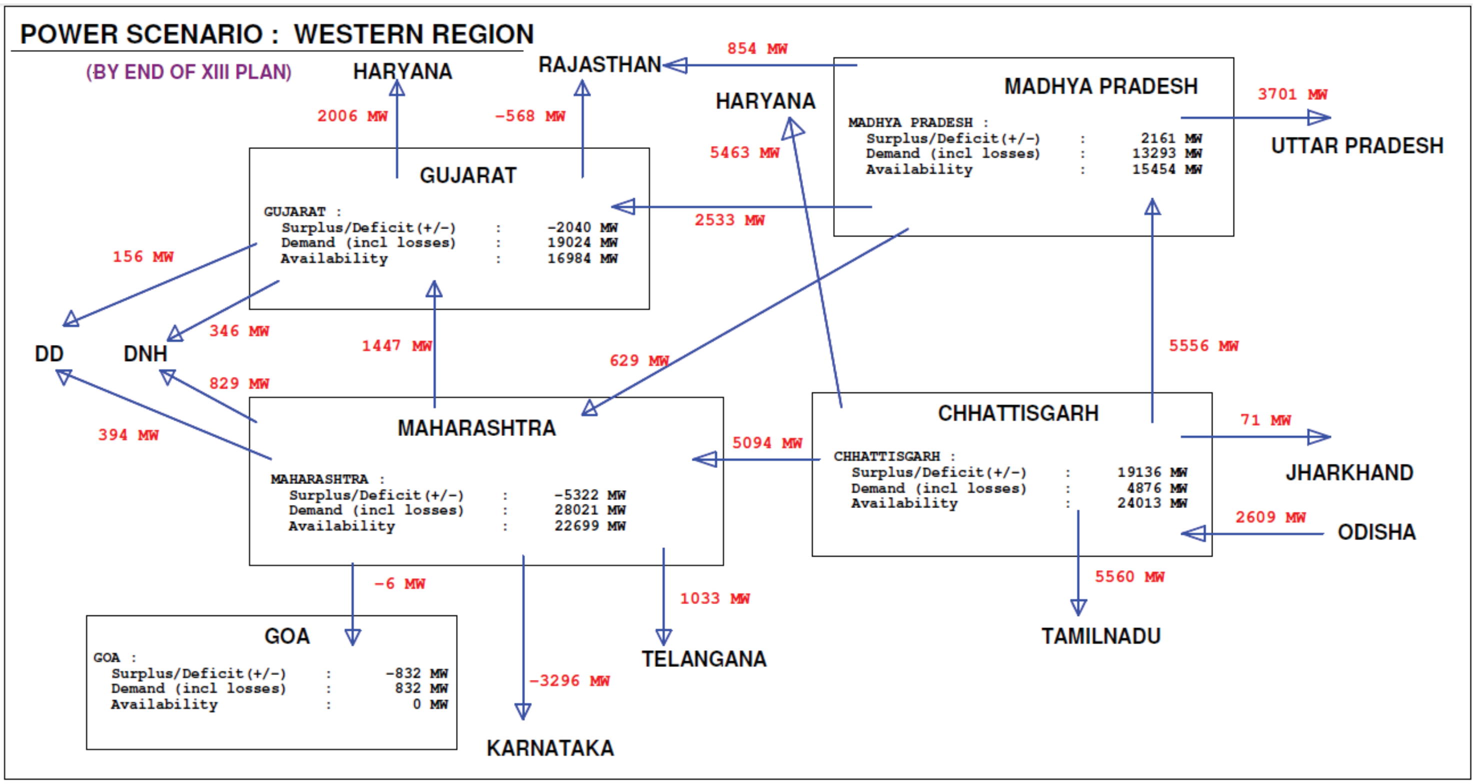
Q1 (WR) **ANNEX: 5.1b**



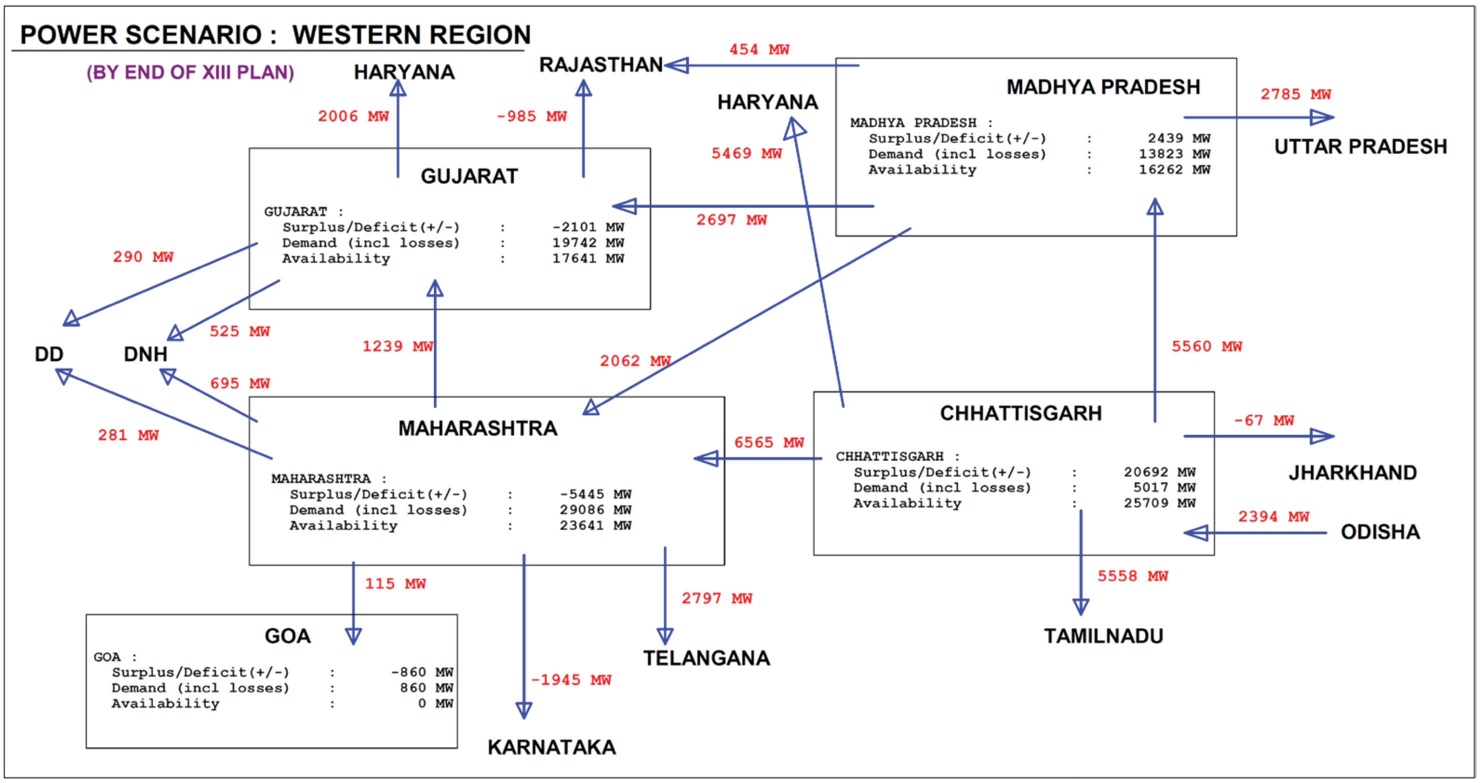
Q2 (WR) **ANNEX: 5.2b**



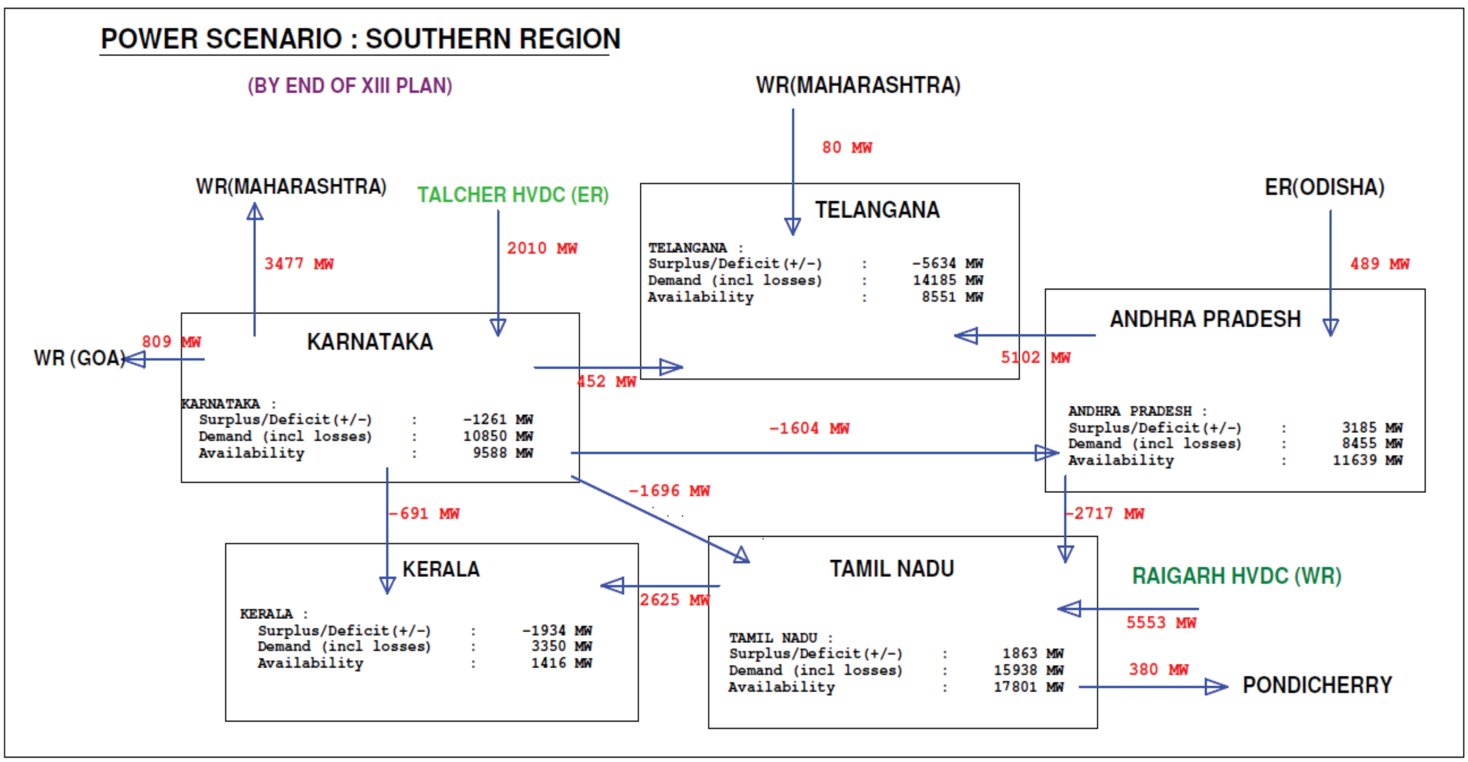
Q3 (WR) ANNEX: 5.3b



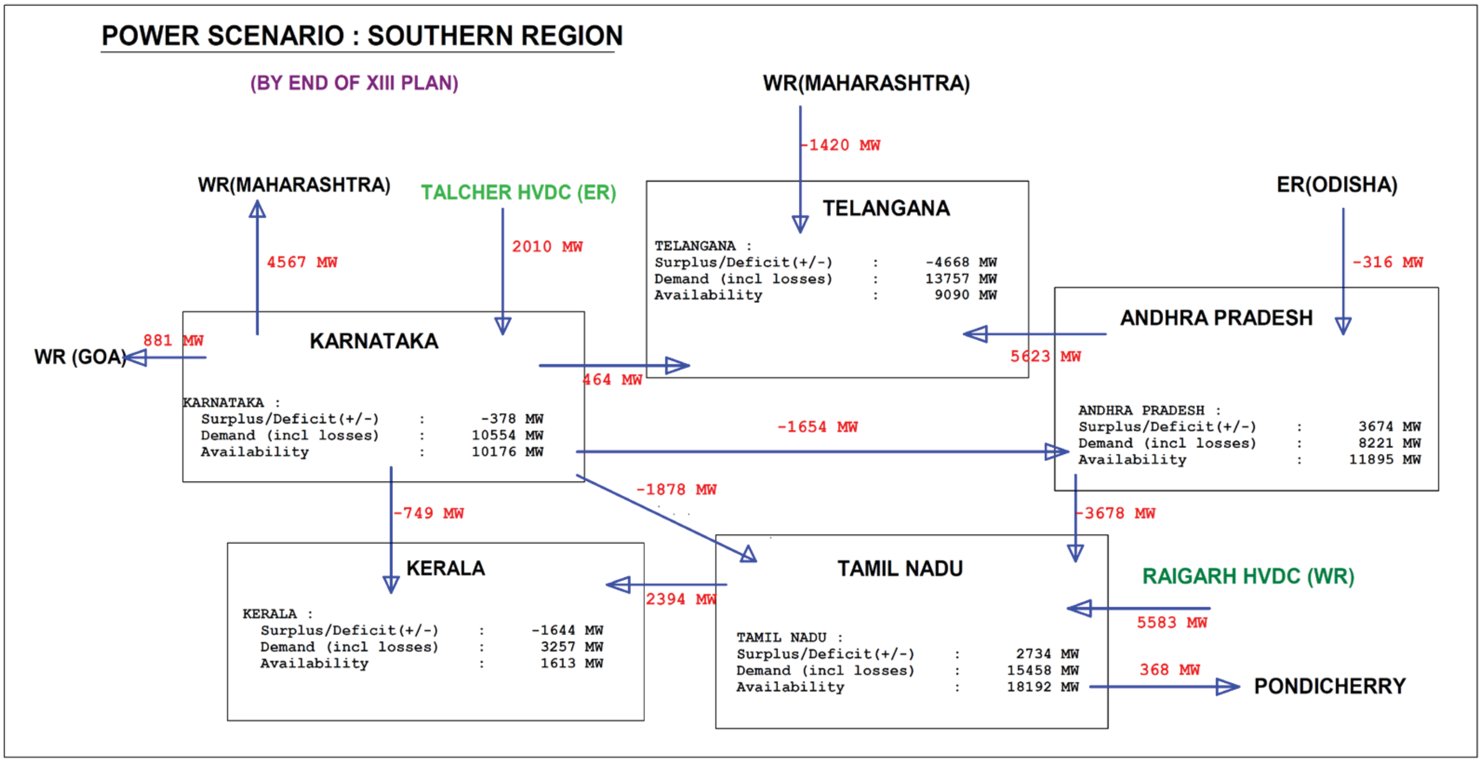
Q4 (WR) **ANNEX: 5.4b**



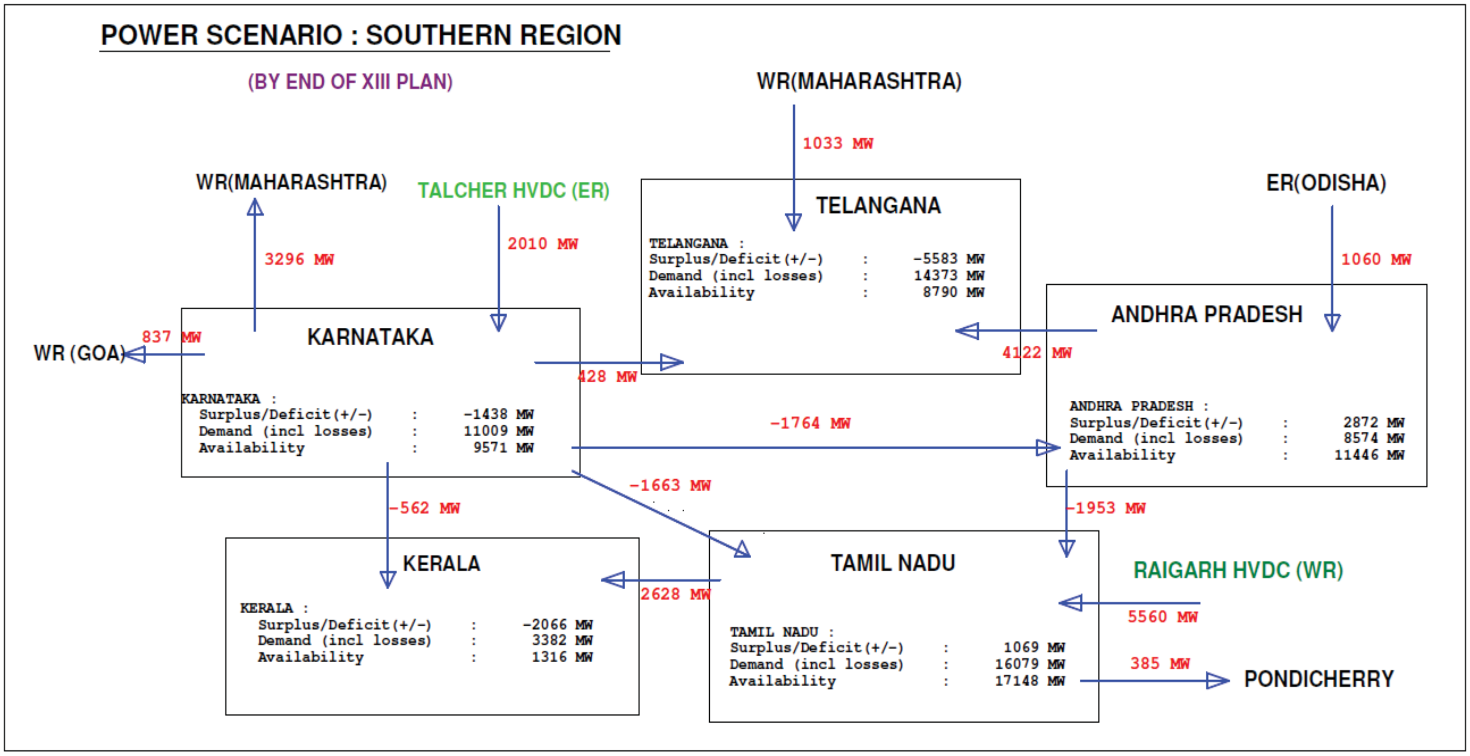
Q1 (SR) ANNEX: 5.1c



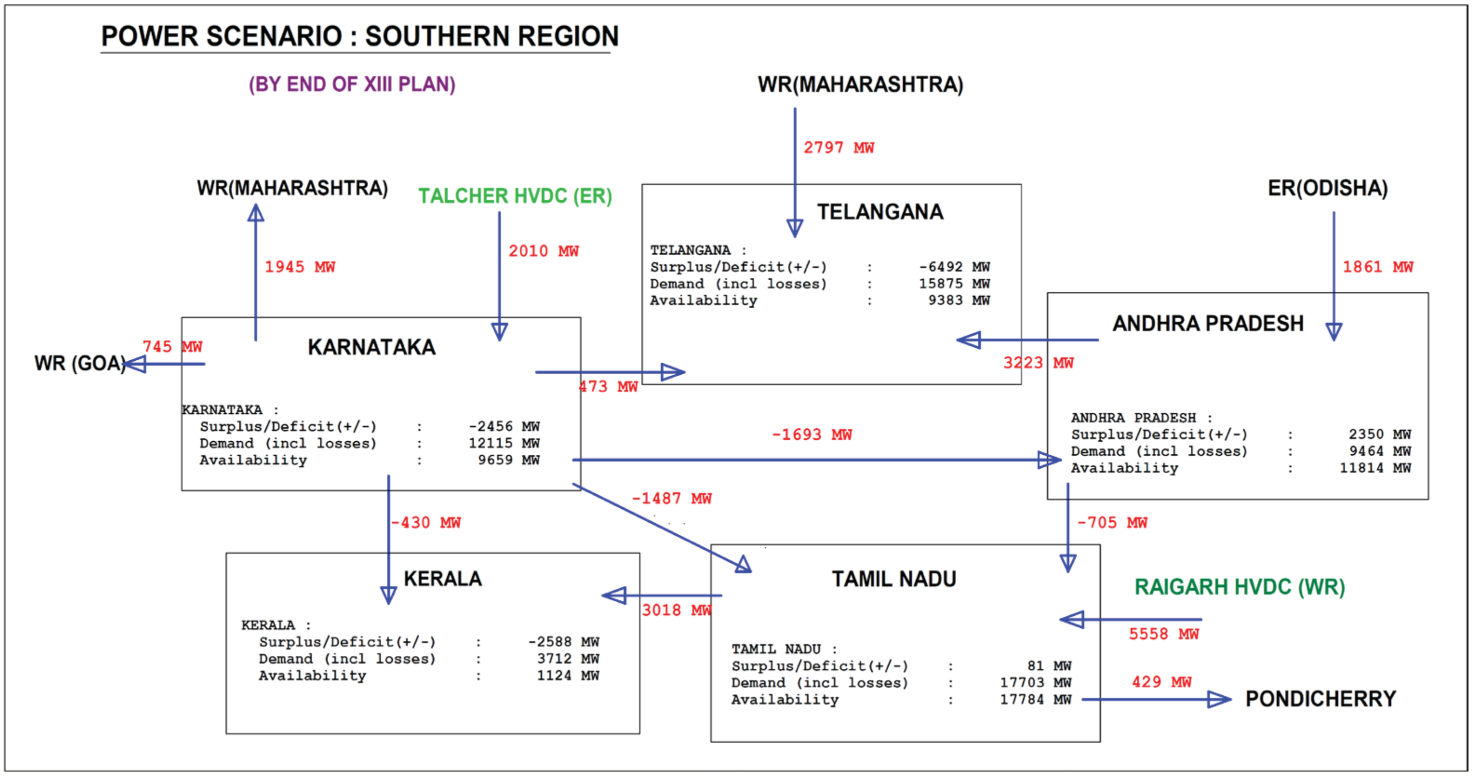
Q2 (SR) **ANNEX: 5.2c**



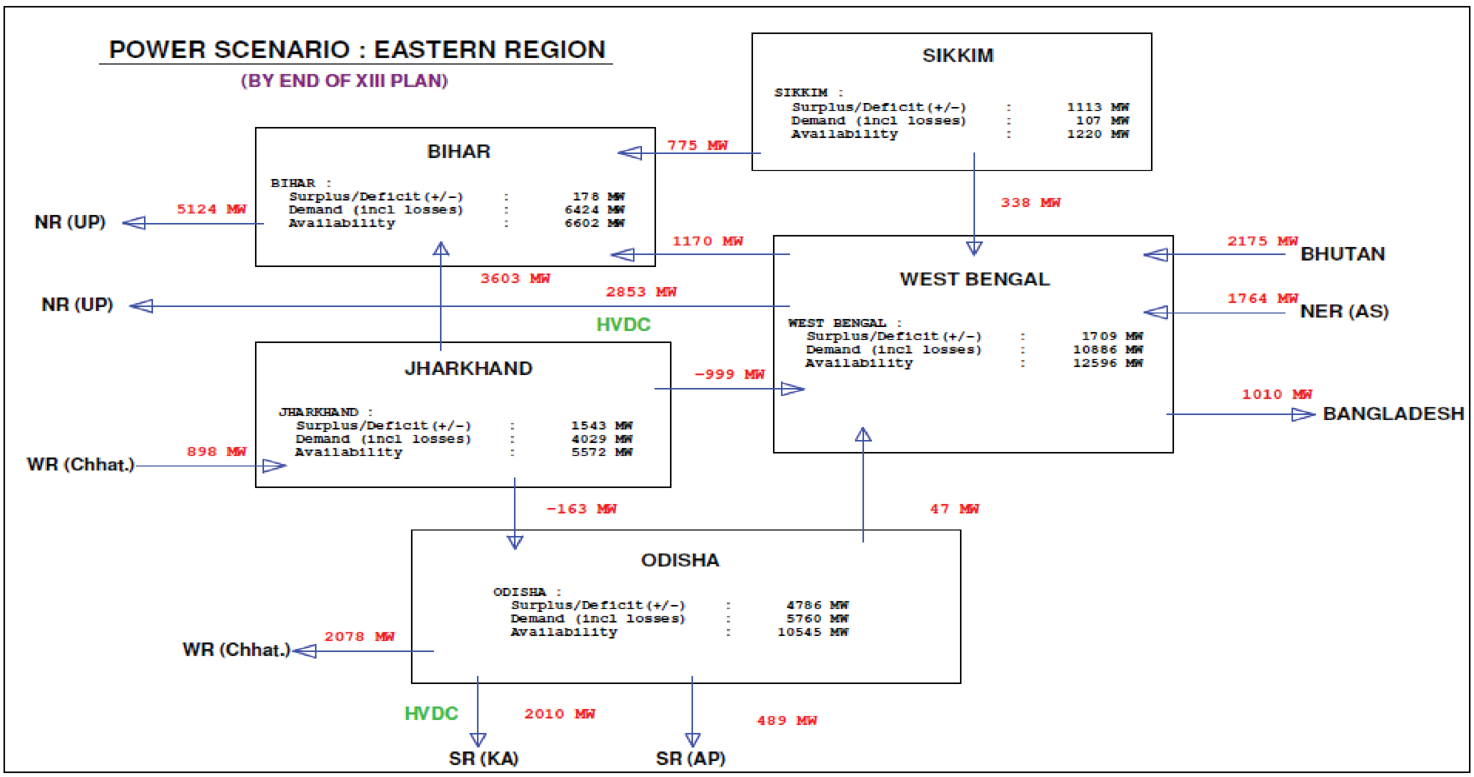
Q3 (SR) ANNEX: 5.3c



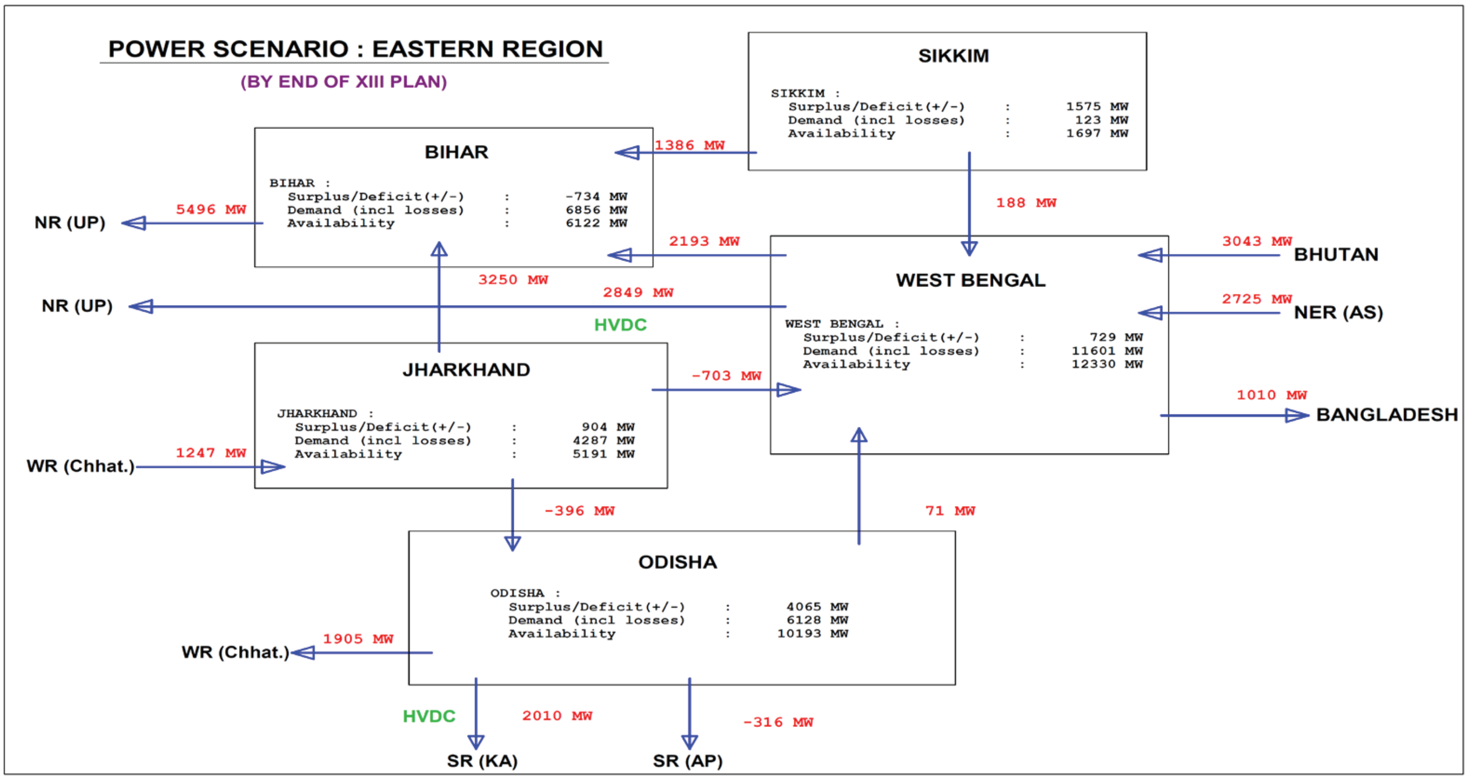
Q4 (SR) **ANNEX: 5.4c**



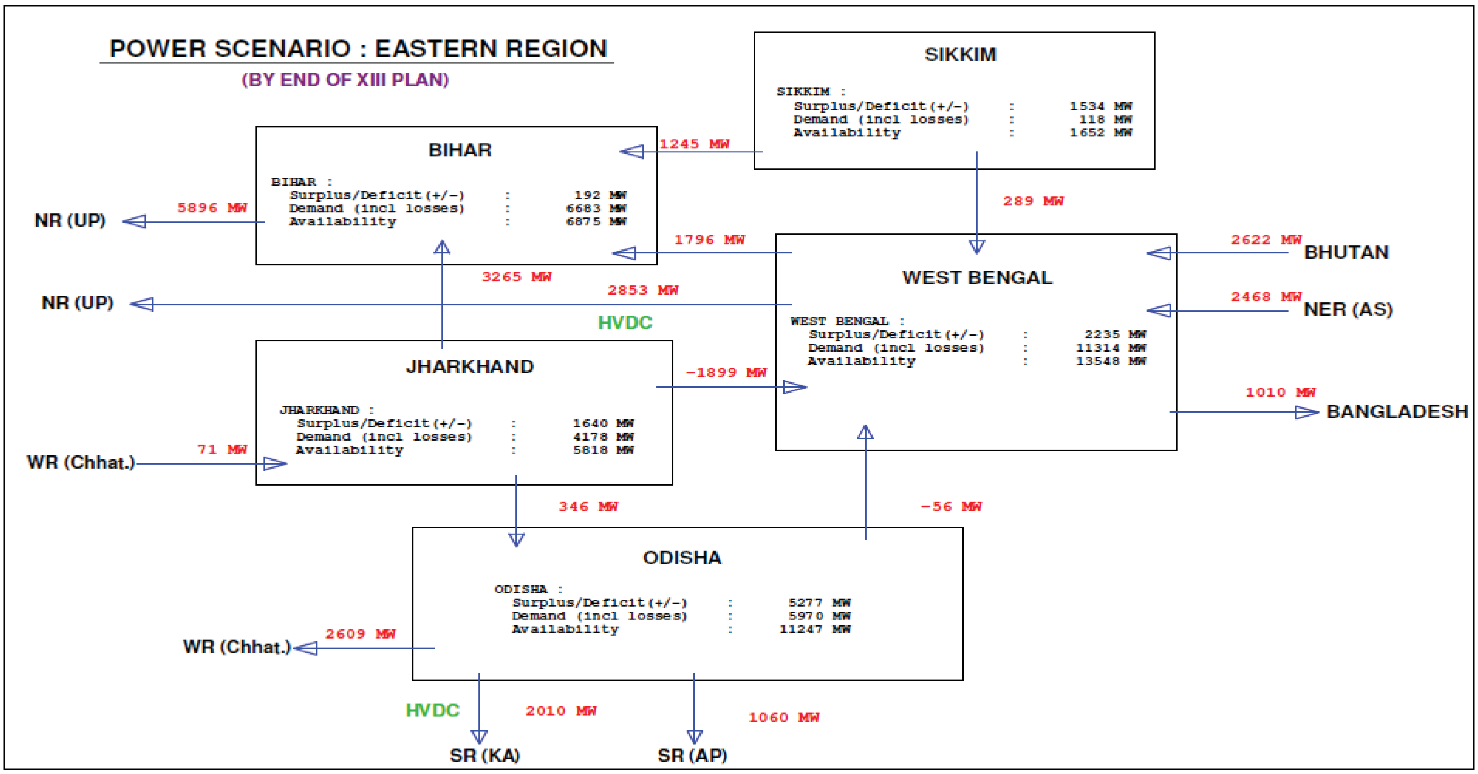
Q1 (ER) **ANNEX: 5.1d**



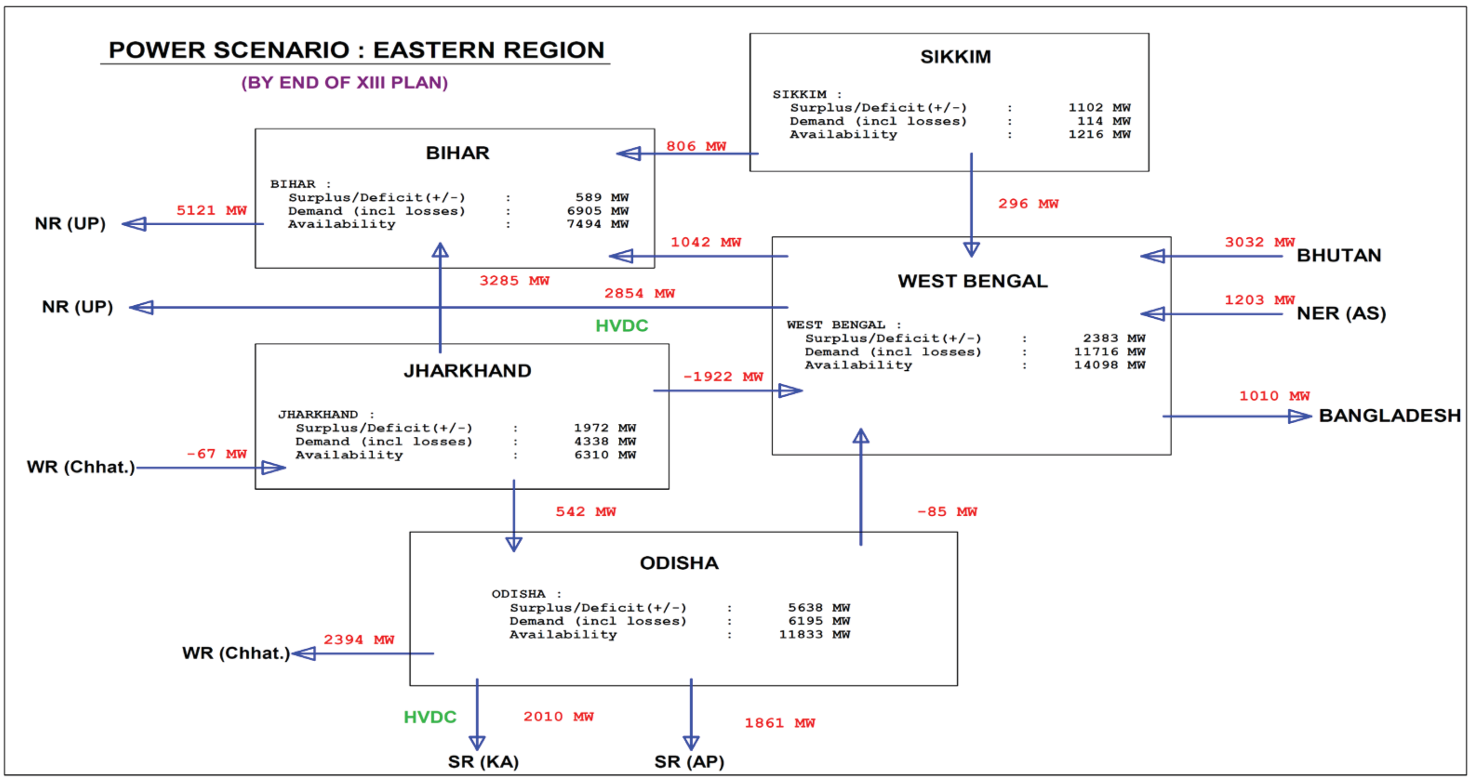
Q2 (ER) ANNEX: 5.2d



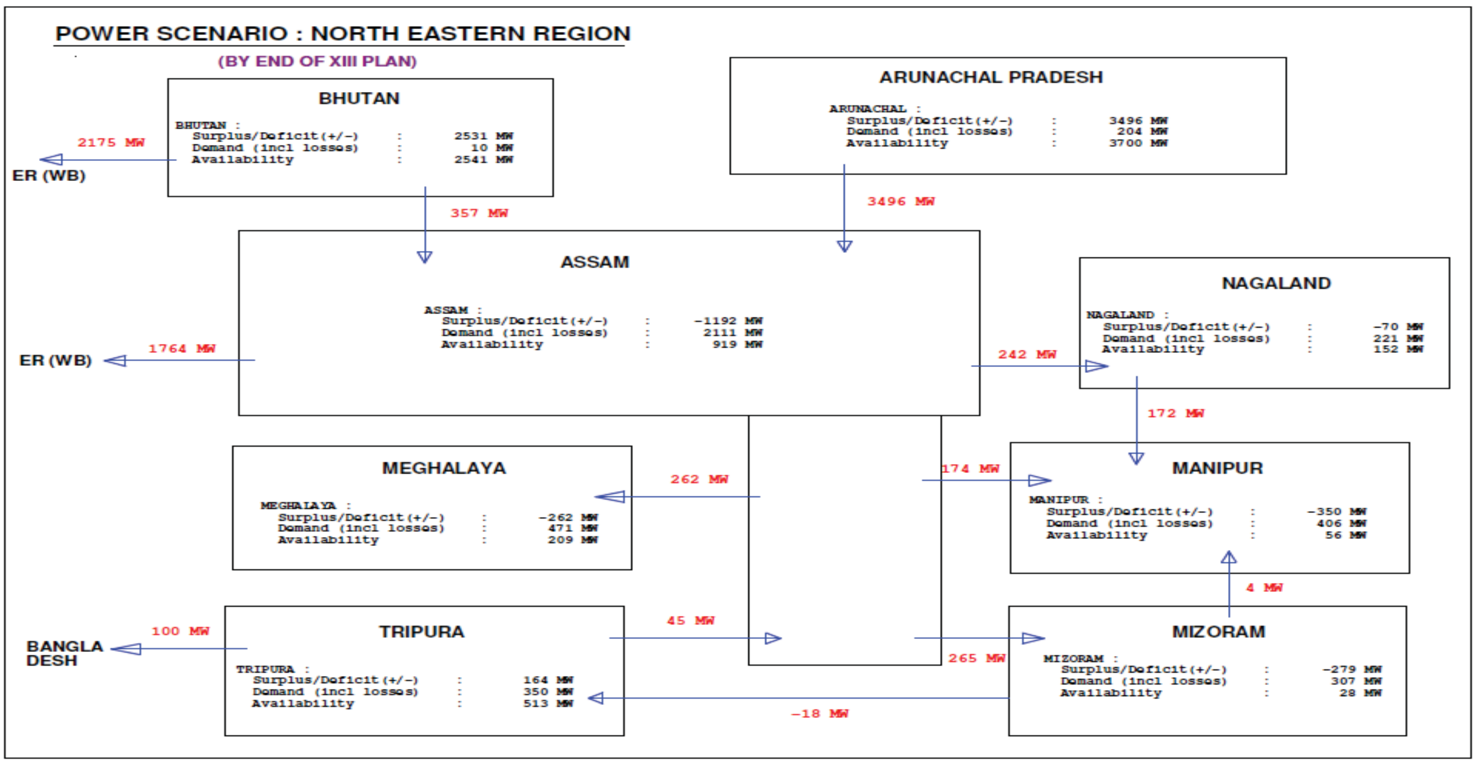
Q3 (ER) ANNEX: 5.3d



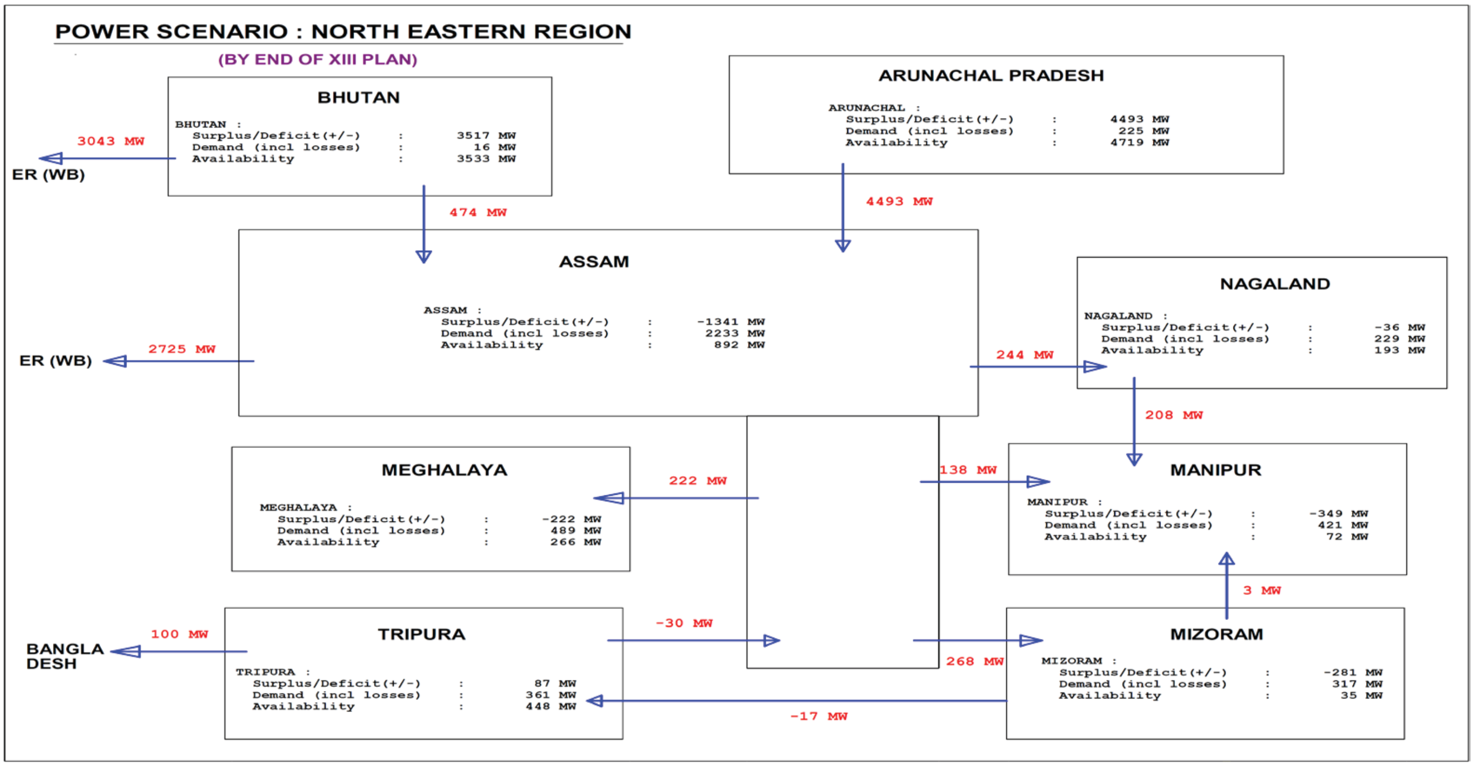
Q4 (ER) **ANNEX: 5.4d**



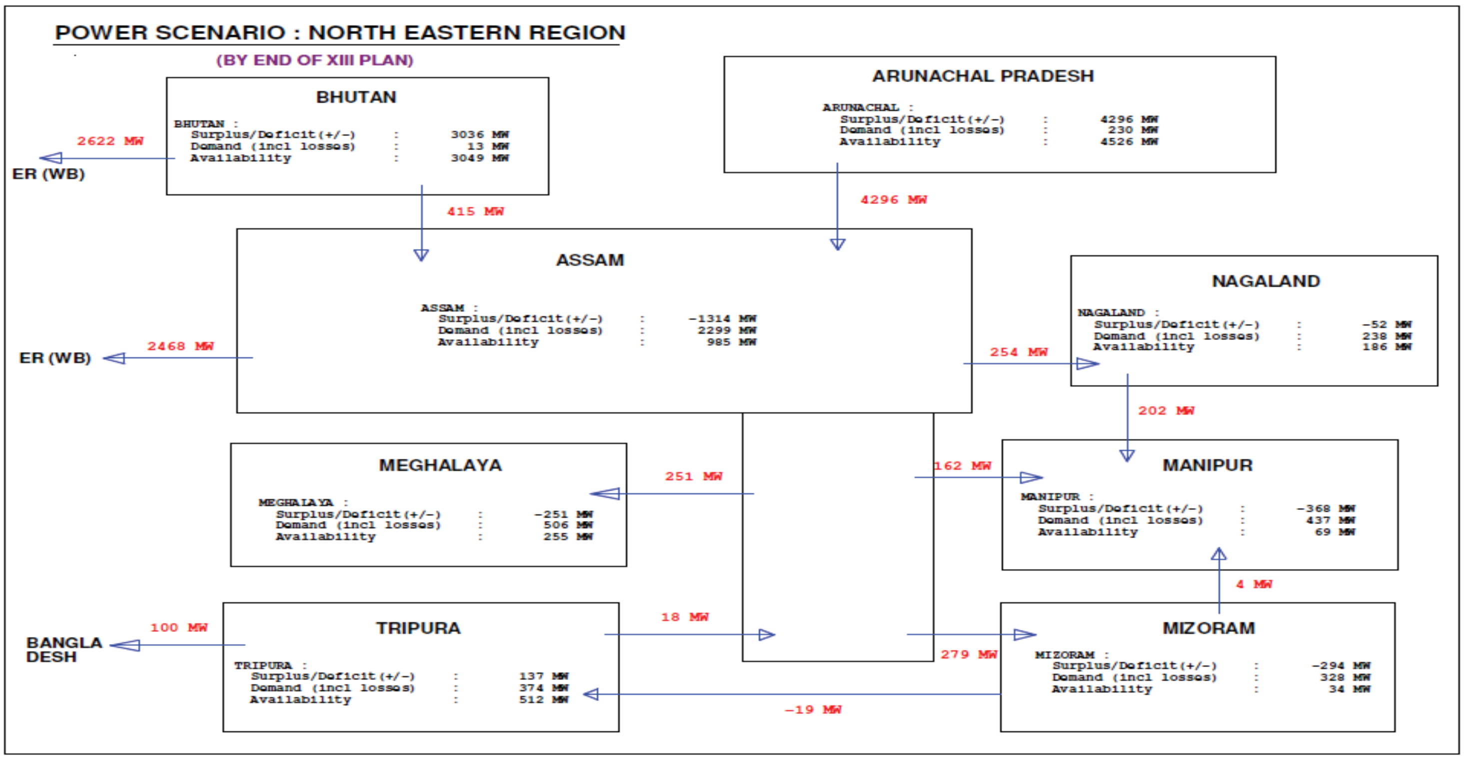
Q1 (NER) ANNEX: 5.1e



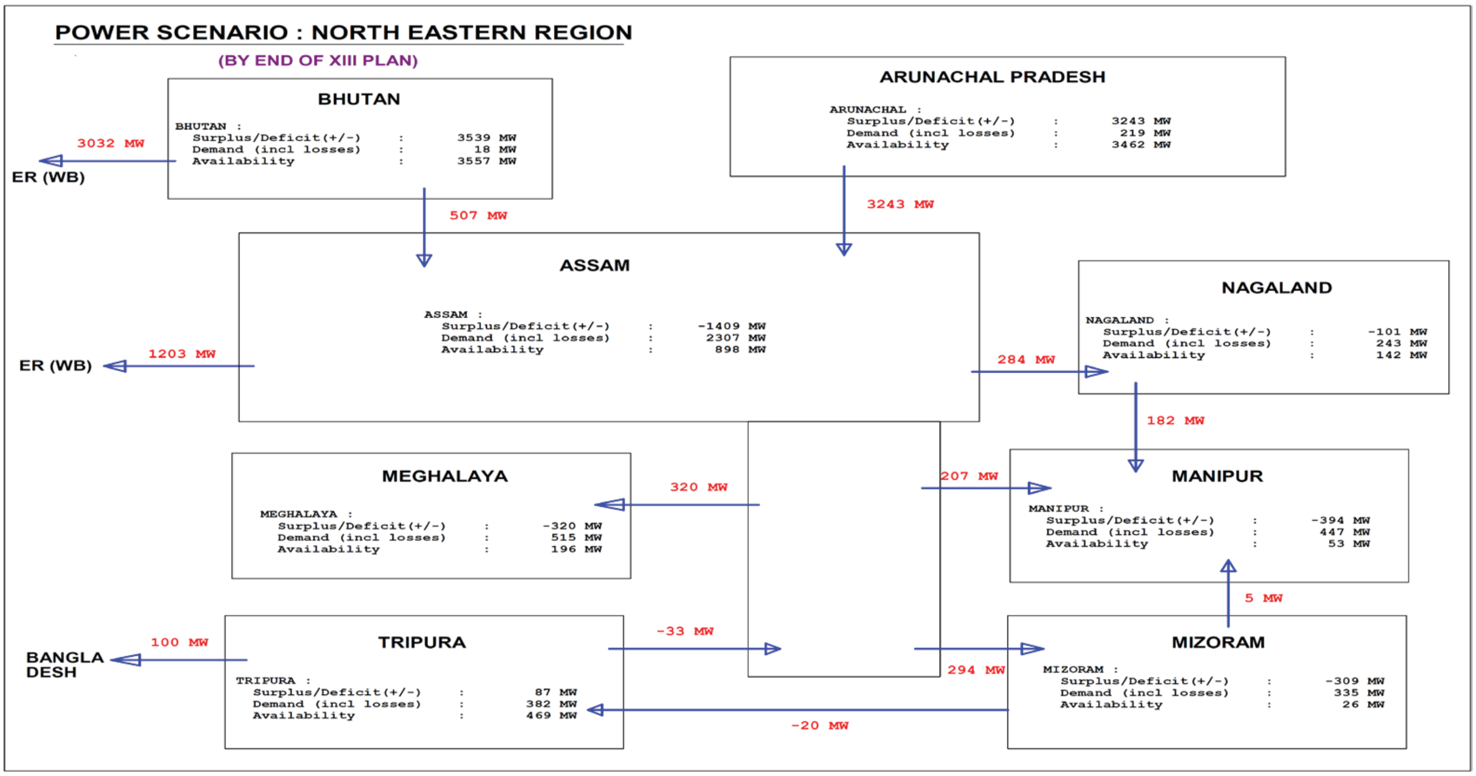
Q2 (NER) ANNEX: 5.2e



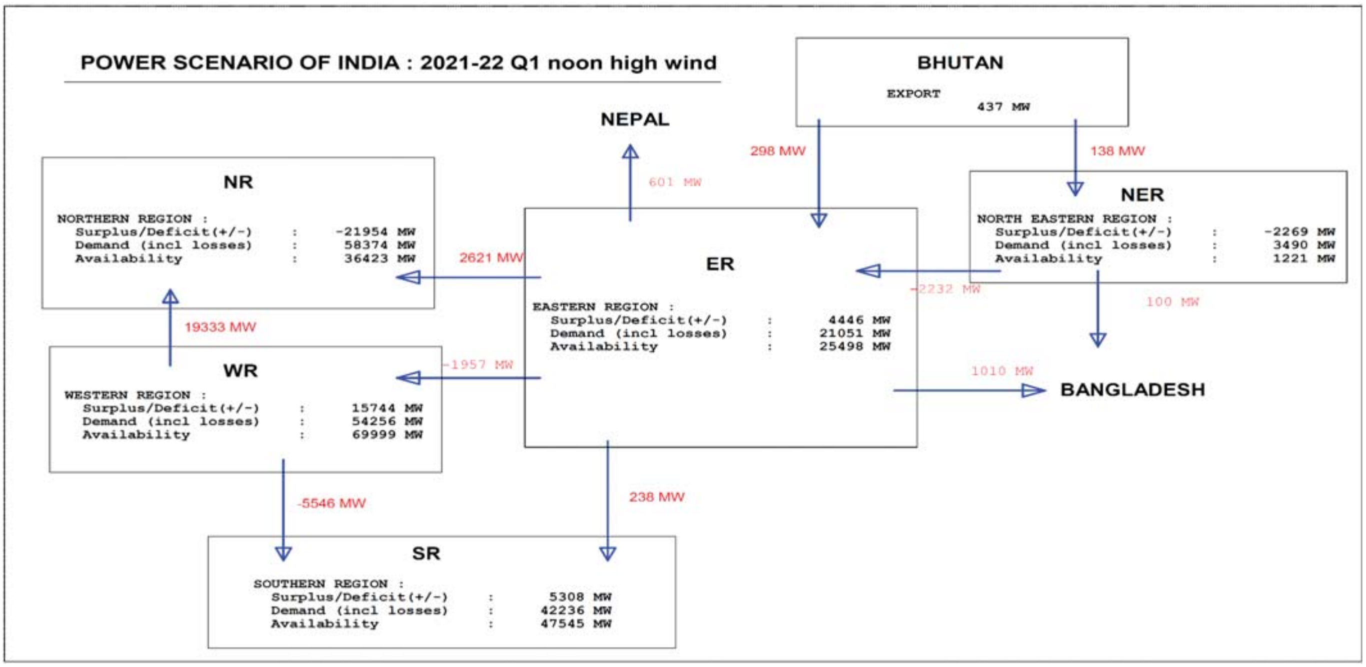
Q3 (NER) — ANNEX: 5.3e



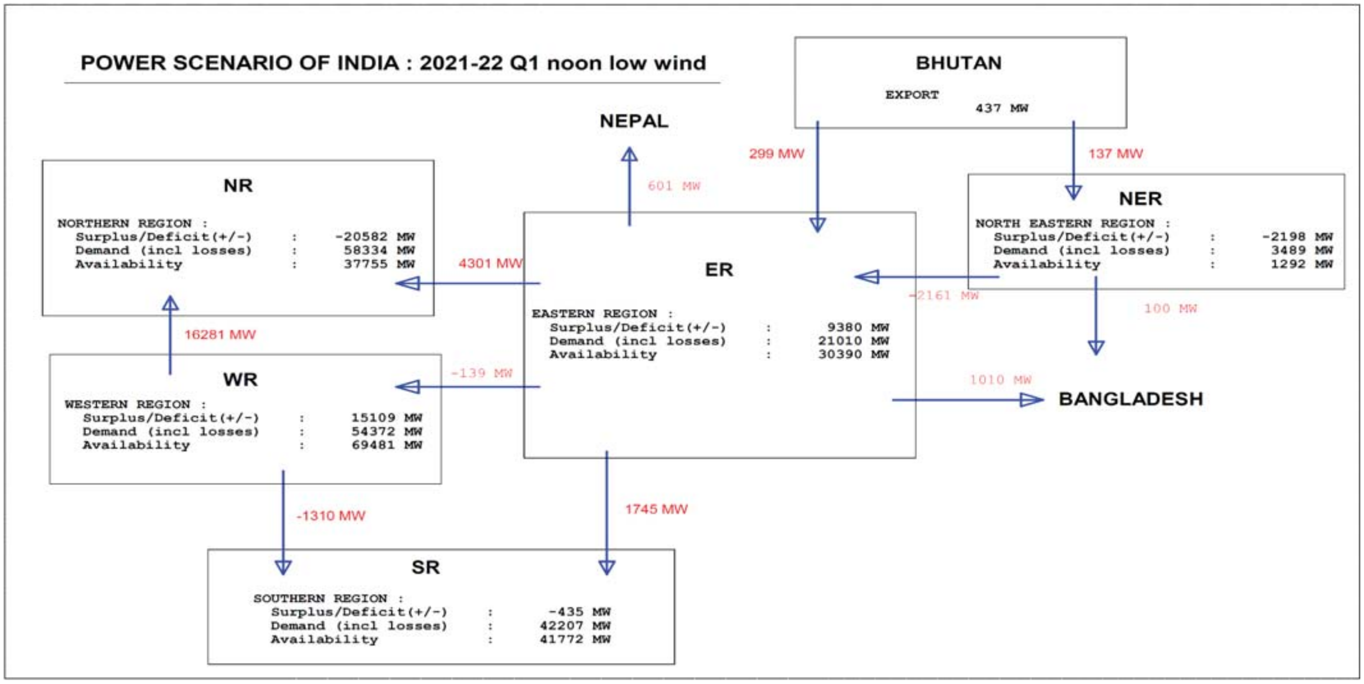
Q4 (NER) ANNEX: 5.4e



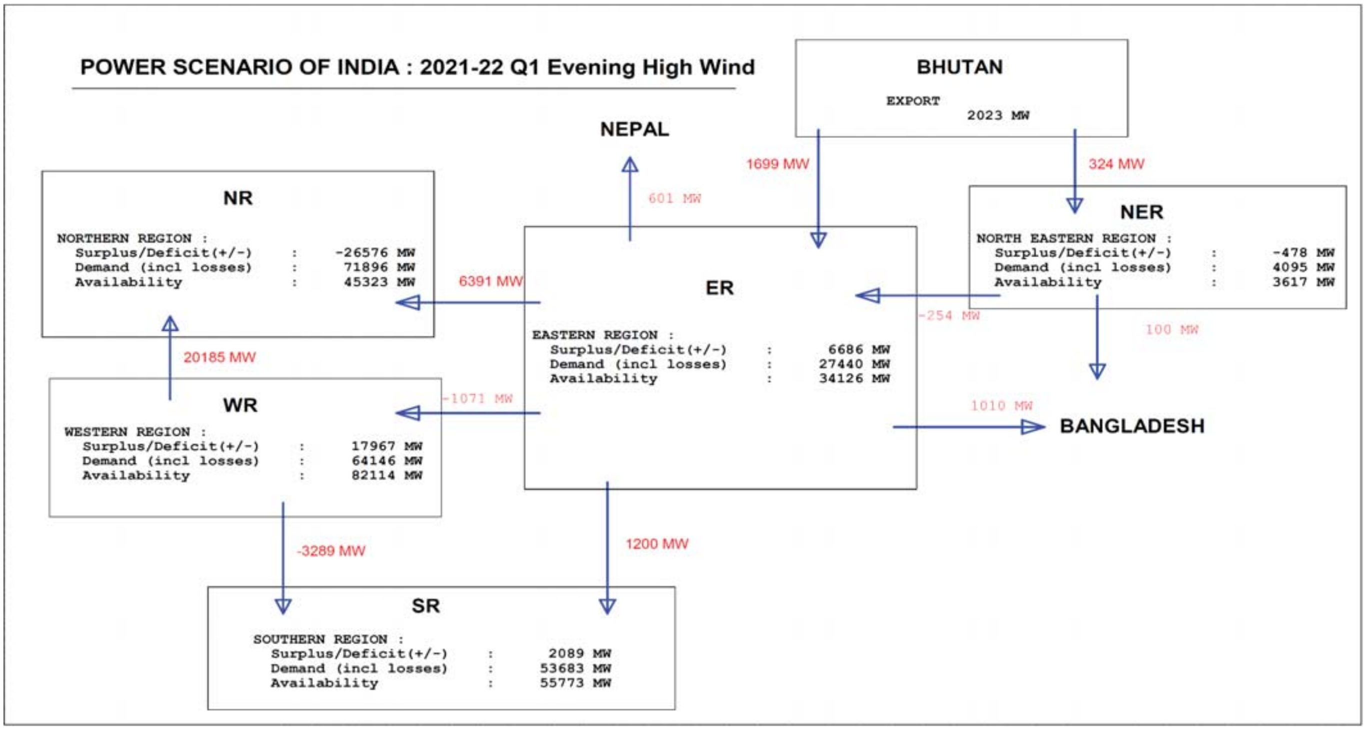
Q1 (Noon High Wind) ANNEX: 5.5a



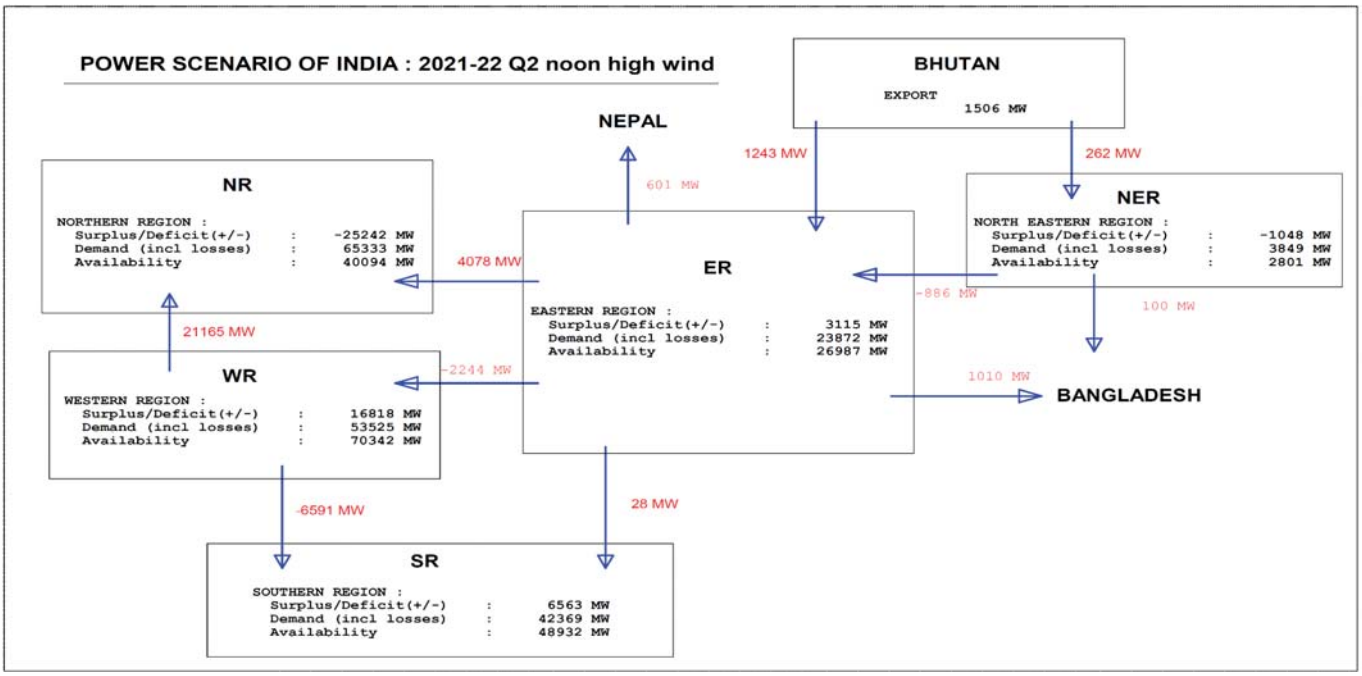
Q1 (Noon Low Wind) ANNEX: 5.5b



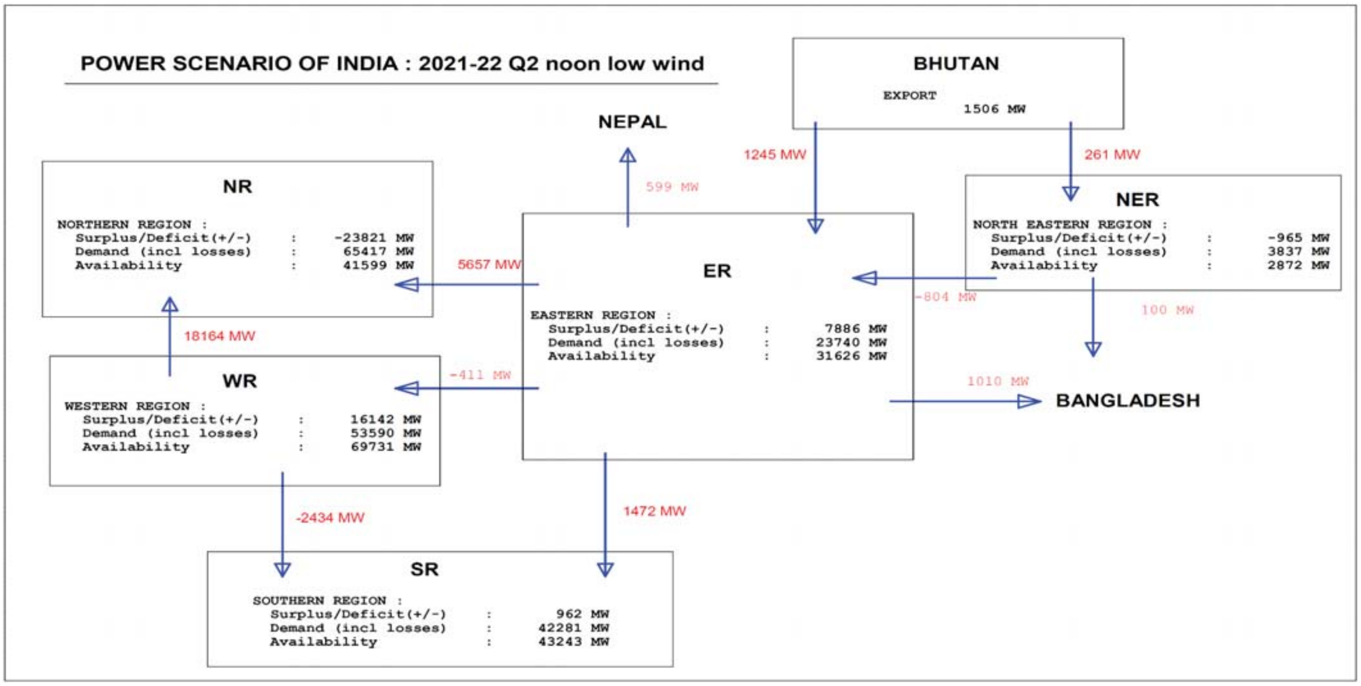
Q1 (Evening High Wind) ANNEX: 5.5c



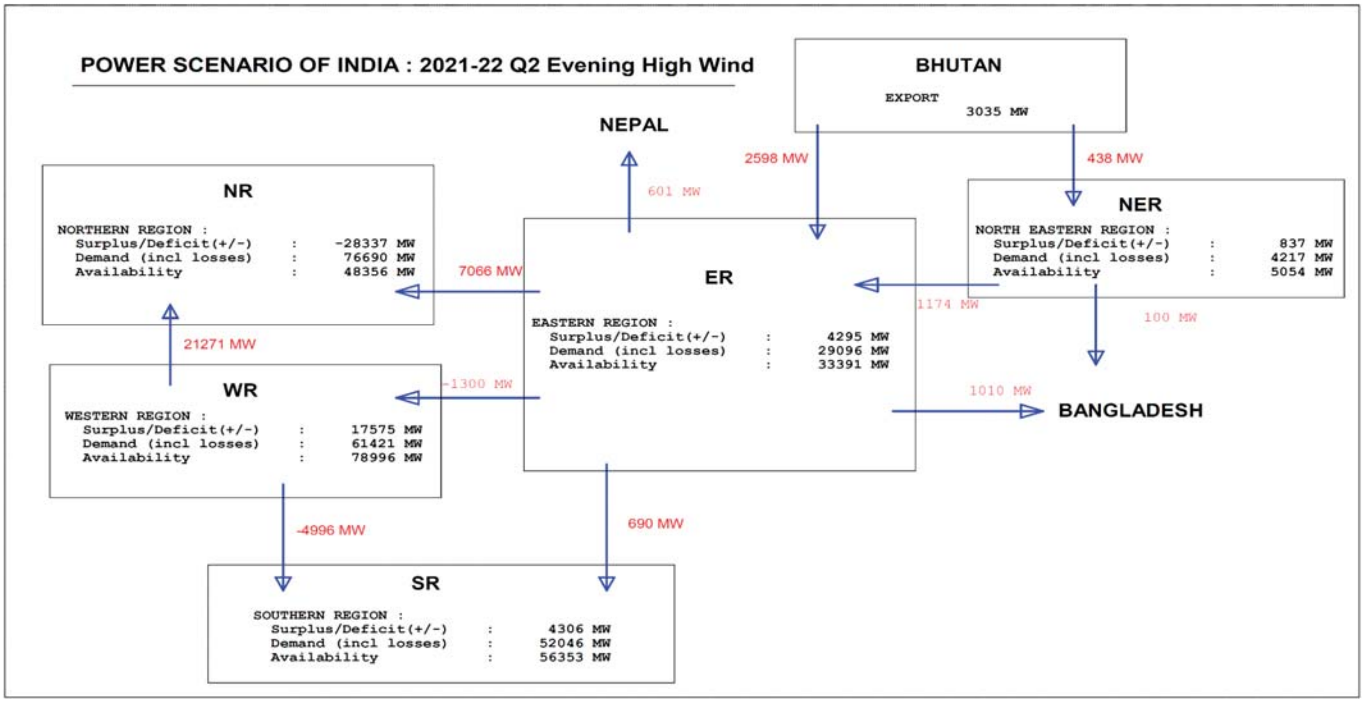
Q2 (Noon High Wind) ANNEX: 5.6a



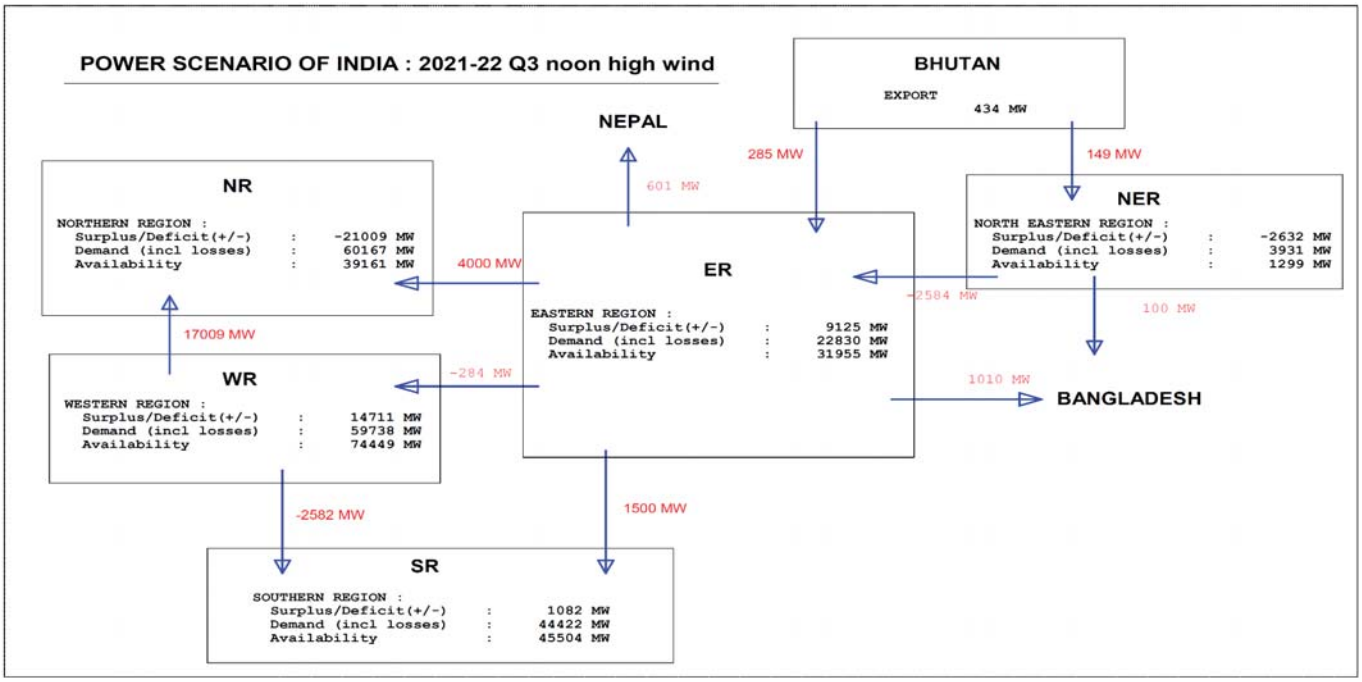
Q2 (Noon Low Wind) ANNEX: 5.6b



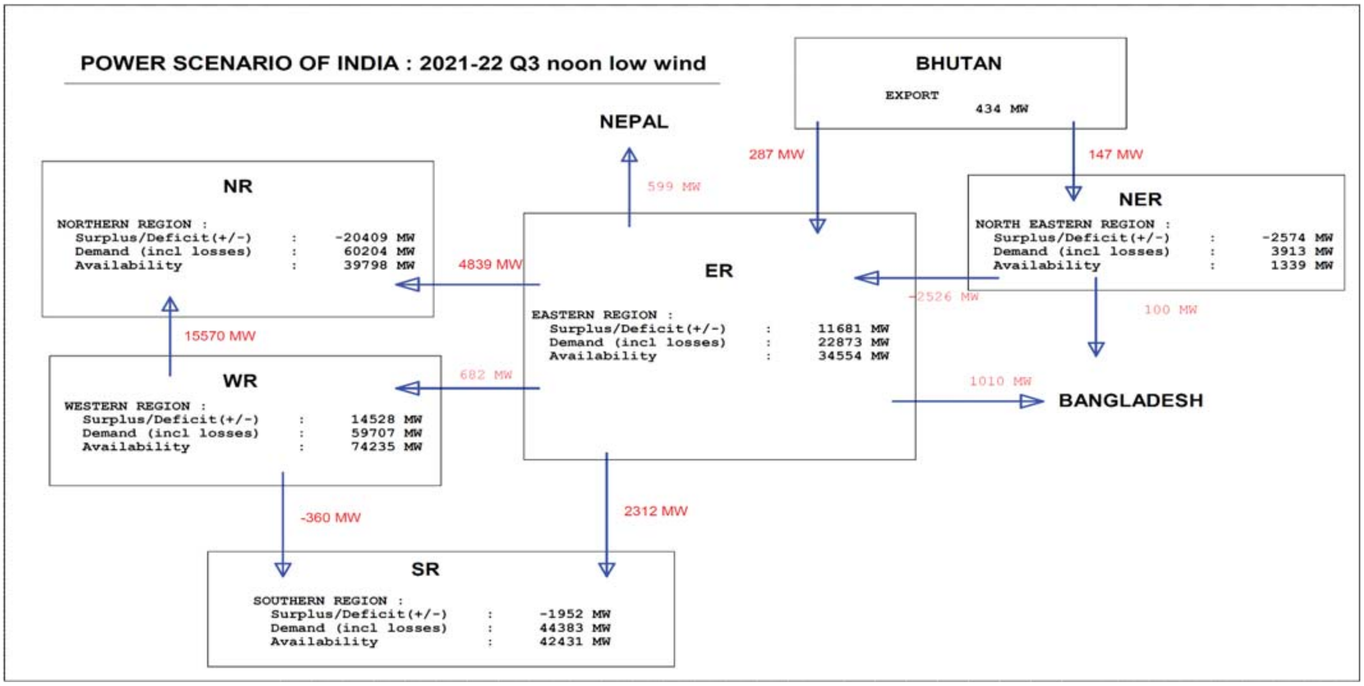
Q2 (Evening High Wind) ANNEX: 5.6c



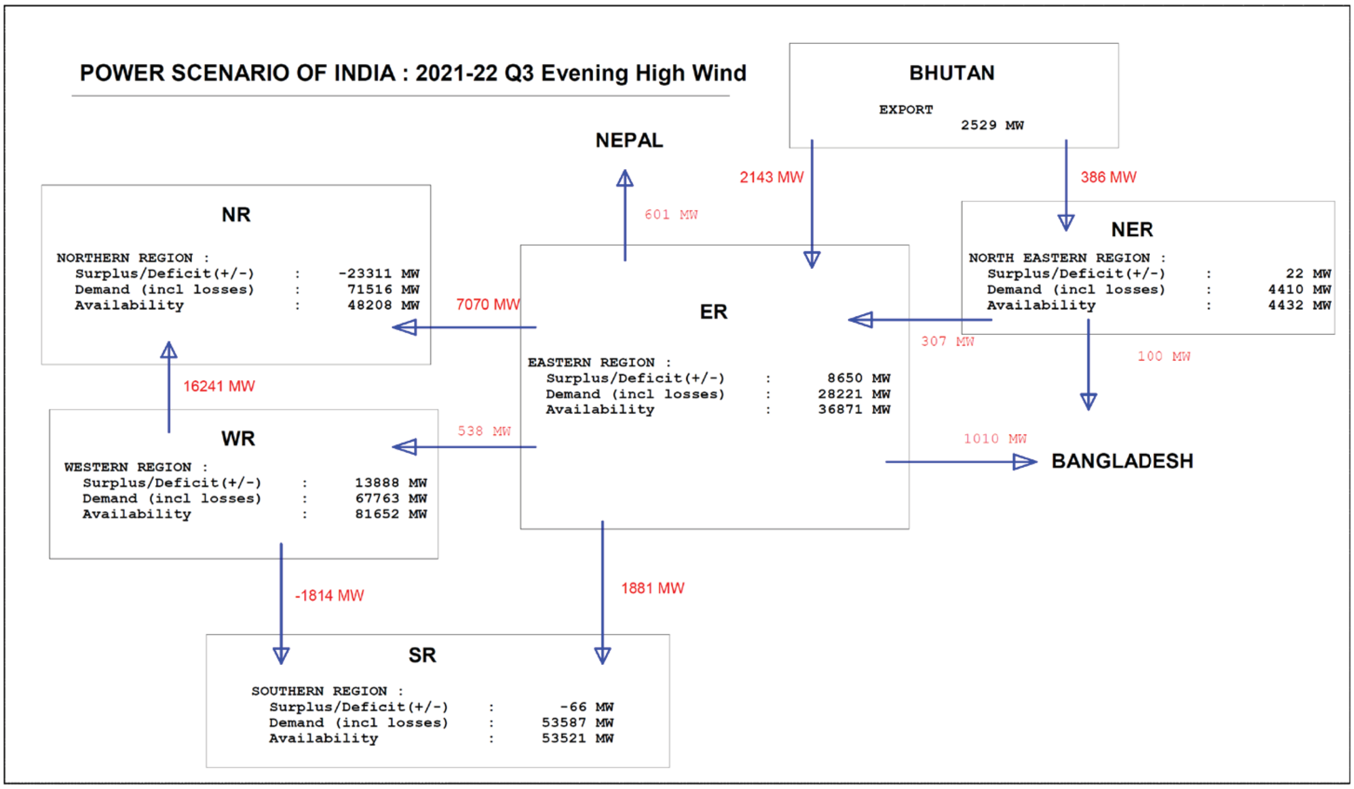
Q3 (Noon High Wind) ANNEX: 5.7a



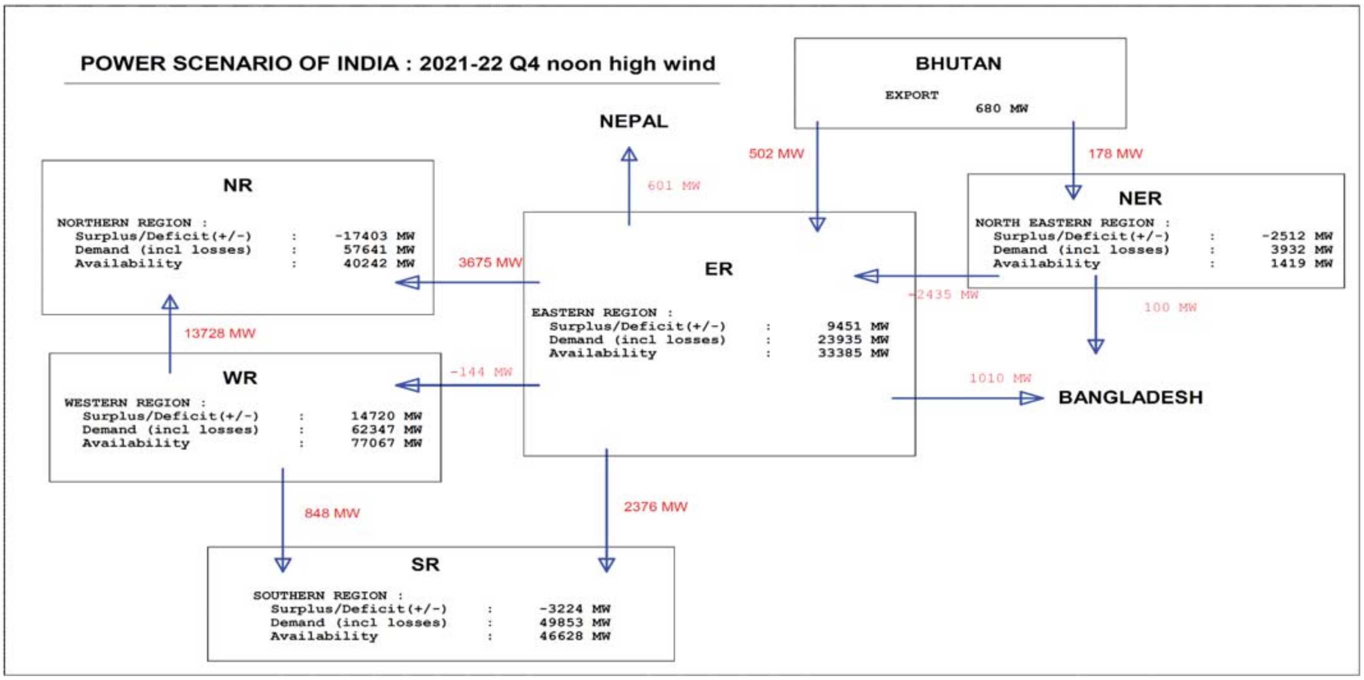
Q3 (Noon Low Wind) ANNEX: 5.7b



Q3 (Evening High Wind) ANNEX: 5.7c

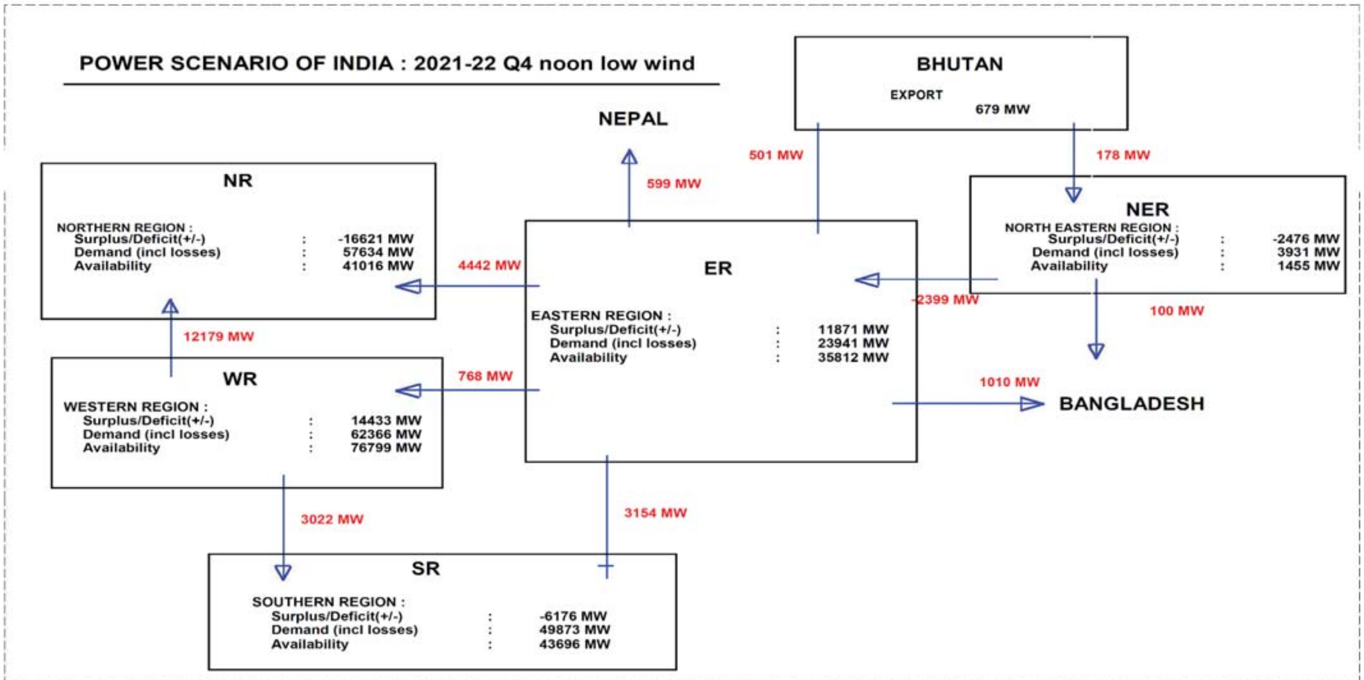


Q4 (Noon High Wind) ANNEX: 5.8a

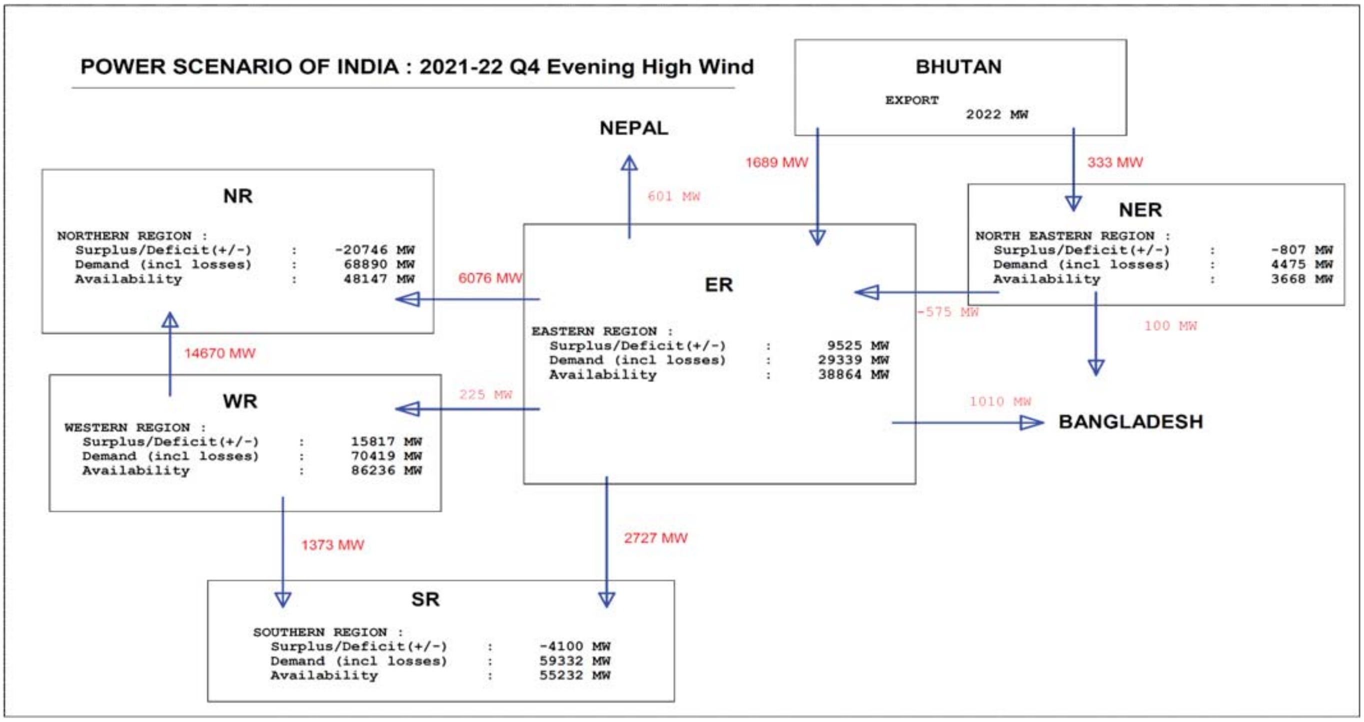


Q4 (Noon Low Wind)

ANNEX: 5.8b



Q4 (Evening High Wind) ANNEX: 5.8c



CHAPTER - 6

REVIEW OF 12TH PLAN PROGRESS AND PROGRAMME

6.1 ADEQUACY OF ON-GOING TRANSMISSION PLAN

6.1.1 At the end of XI Five-Year Plan, i.e. as on 31st March 2012 the transmission system in the country at 765/HVDC/400/230/220kV votage levels was 258 thousand circuit kilometres (T ckm) of transmission lines and 410 GVA of substation capacity. The corresponding installed generation capacity was 199 GW and peak demand of 130 GW was met.

6.1.2 Considering a demand of 198 GW as forecasted by the 18th EPS, the generation capacity addition requirement for the XIIth Plan was assessed to be about 88 GW. However, the present (April-October, 2016) demand is only 159 GW and may reach about 165 GW by the end of 12th Plan i.e.31st March 2017. Out of this generation addition projection of 88 GW, 21.3 GW has slipped from 12th Plan and new generation capacity of about 35 GW has been/likely to be commissioned till end of 12th Plan period which were not in the original capacity addition programme of 88 GW. Thus, the total capacity now expected to be commissioned during 12th Plan would be 102 GW.

6.1.3 This generation – load scenario became the basis for taking up detailed planning exercise and finalizing of their transmission development programme by the Central Transmission Utility and the State Transmission Utilities corresponding to the actual pace of 12th Plan development happening in generation and the actual area-wise load growths. And, accordingly, 107440 CKM (circuit kilometres) of transmission lines and 270000 MVA of substation transformation capacity, at 220kV and above voltage levels, was planned.

6.1.4 Implementation of the transmission plan is going fairly well. It is expected that a total of 107454 CKM of transmission lines and 287836 MVA of substation transformation capacity additions are likely to be achieved during 12th plan period. This is a significant achievement both for the planning process and its implementation.

6.1.5 Though, the progress of transmission addition has been quite impressive, the transmission alone can not define deliverability of the total power system. The configuration of power system which also consists of generation, load and their spatial distribution is very important. The actual generation capacity addition during 12th Plan, however, has been at variance with the target. The net variation in the generation is about 48 GW of the projection of 88 GW, a deviation of about (+) 55 %. At the end of 11th Plan, the peak demand was 130 GW, which as per the 18th EPS projected it to be 198 GW at the end of 12th Plan, i.e. an increment of 68 GW. However, the actual increment may only be about 35 GW, (i.e. a demand of 165 GW by the end of 12th Plan, thus a variation of (-) 52% from the EPS projections.

6.1.6 Notwithstanding the above variations, transmission constraints only during short-term periods are sometimes experienced. This is mainly due to delay/slip in the upcoming generation projects as per target and addition of some generating units outside the target. A few of the transmission works were also got delayed/held up because of Right-of-Way (RoW) issues, non-availability/delay in getting Forest Clearance and delay in land acquisition for sub-stations.

6.2 SUMMARY OF EXISTING (IX to XII PLAN) TRANSMISSION SYSTEM

6.2.1 The following table gives the transmission system in the country as achieved at the end of IX, X, and XI Plan periods:

	Unit	At the end of IX Plan ie March 2002	At the end of X Plan ie March 2007	At the end of XI Plan ie March 2012
TRANSMISSION LINES		**IX Plan**	**X Plan**	**XI Plan**
HVDC +/- 500 kV	Ckm	3138	5872	9432
765 kV	Ckm	971	2184	5250
400 kV	Ckm	49378	75722	106819
230/220 kV	Ckm	96993	114629	135980
Total Transmission Line	**Ckm**	**150480**	**198407**	**257481**
SUBSTATIONS – AC		**IX Plan**	**X Plan**	**XI Plan**
765 kV	MVA	0	0	25000
400 kV	MVA	60380	92942	151027
230/220 kV	MVA	116363	156497	223774
Total- AC Substation	**MVA**	**176743**	**249439**	**399801**
HVDC TERMINALS		**IX Plan**	**X Plan**	**XI Plan**
HVDC Bipole+Monopole	MW	3000	5000	6750
HVDC BTB	MW	2000	3000	3000
Total- HVDC Terminal Capacity	**MW**	**5000**	**8000**	**9750**

6.2.2 The following tables give progress of transmission system addition during 12th Plan period.

Summary of progress during 12th Plan upto March, 2016:

Transmission System Type / Voltage Class	Unit	At the end of XI Plan (Mar. 2012)	Targeted Addition for XII Plan	Added during XII Plan i.e. up to March, 2016	%Achieved WRT Plan Target(March 2016)
TRANSMISSION LINES					
(a) HVDC ± 500kV/ ± 800 kV Bipole	Ckm	9432	7440	3506	47.12%
(b) 765 kV	Ckm	5250	27000	18995	70.35%
(c) 400 kV	Ckm	106819	38000	40311	106.08%
(d) 230/220kV	Ckm	135980	35000	21258	60.74%
Total–Transmission Lines	**Ckm**	**257481**	**107440**	**84070**	**78.25%**
SUBSTATIONS					
(a) 765 kV	MVA	25000	149000	116000	77.85%
(b) 400 kV	MVA	151027	45000	58440	129.87%
(c) 230/220 kV	MVA	223774	76000	69708	91.72%
Total – Substations	***MVA***	**399801**	**270000**	**244148**	**90.43%**
HVDC					
(a)Bi-pole link capacity	MW	6750	12750	5250	41.18%
(b) Back-to back capacity	MW	3000	0	0	
Total of (a), (b)	**MW**	**9750**	**12750**	**5250**	**41.18%**

Up to 10th Plan, the ckm figures show the total stringing carried out. From 11th Plan onwards, the policy has changed to reckon only the lines that have been commissioned or have become ready for commissioning. Accordingly, the addition during 11th Plan has been adjusted with 10852 ckm. (765kV – 480 ckm, 400kV – 6548 ckm and 220kV – 3824 ckm).

Summary of progress during 12th Plan upto October, 2016:

Transmission System Type / Voltage Class	Unit	At the end of XI Plan (Mar. 2012)	Targeted Addition for XII Plan	Added during XII Plan i.e. up to Oct, 2016	%Achieved WRT Plan Target(Oct, 2016)
TRANSMISSION LINES					
(a) HVDC ± 500kV/± 800 Bipole	Ckm	9432	7440	6080	81.72%
(b) 765 kV	Ckm	5250	27000	23024	85.27%
(c) 400 kV	Ckm	106819	38000	46328	121.92%
(d) 230/220kV	Ckm	135980	35000	25036	71.53%
Total–Transmission Lines	**Ckm**	**257481**	**107440**	**100468**	**93.51%**
SUBSTATIONS					
(a) 765 kV	MVA	25000	149000	129500	86.91%

Transmission System Type / Voltage Class	Unit	At the end of XI Plan (Mar. 2012)	Targeted Addition for XII Plan	Added during XII Plan i.e. up to Oct, 2016	%Achieved WRT Plan Target(Oct, 2016)
(b) 400 kV	MVA	151027	45000	74360	165.24%
(c) 230/220 kV	MVA	223774	76000	77848	102.43%
Total – Substations	***MVA***	**399801**	**270000**	**281708**	**104.34%**
HVDC					
(a)Bi-pole link capacity	MW	6750	12750	6750	52.94%
(b) Back-to back capacity	MW	3000	0	0	
Total of (a), (b)	**MW**	**9750**	**12750**	**6750**	**52.94%**

6.2.3 The following tables give comaritive assessment of targets and achievments of transmission system addition during 12th Plan period.

Target verses Achievement(likely) during 12th Plan period

Transmission System Type / Voltage Class	Unit	Added during first four years of XII Plan i.e. up to March, 2016	Expected addition during 2016-17	Expected to be added during 12th Plan	Targeted Addition for XII Plan	%Achieved WRT Plan Target during XII plan
TRANSMISSION LINES						
(a) HVDC ± 500kV/± 800 Bipole	Ckm	3506	2597	6103	7440	82%
(b) 765 kV	Ckm	18995	5186	24181	27000	90%
(c) 400 kV	Ckm	40311	10514	50825	38000	134%
(d) 230/220kV	Ckm	21258	5087	26345	35000	75%
Total– Transmission Lines	**Ckm**	**84070**	**23384**	**107454**	**107440**	**100%**
SUBSTATIONS						
(a) 765 kV	MVA	116000	14000	130000	149000	87%
(b) 400 kV	MVA	58440	24905	83345	45000	185%
(c) 230/220 kV	MVA	69708	4783	74491	76000	98%
Total – Substations	***MVA***	**244148**	**43688**	**287836**	**270000**	**107%**
HVDC						
(a)Bi-pole link capacity	MW	5250	1500	6750	12750	53%
(b) Back-to back capacity	MW	0	0	0	0	
Total of (a), (b)	**MW**	**5250**	**1500**	**6750**	**12750**	**53%**

6.2.4 The following tables give cumulative addition up to end of 12th Plan period i.e. by March 2017 (expected)

Commulative addition up to end of 12th Plan period

Transmission System Type / Voltage Class	Unit	At the end of 10th Plan (Mar. 2007)	At the end of 11th Plan (Mar. 2012)	Expected to be added during 12th Plan	Commulative Expected at the end of 12th Plan
TRANSMISSION LINES					
(a) HVDC ± 500kV/800 kV Bipole	Ckm	5872	9432	6103	15535
(b) 765 kV	Ckm	2184	5250	24181	29431
(c) 400 kV	Ckm	75722	106819	50825	157644
(d) 230/220kV	Ckm	114629	135980	26345	162325
Total–Transmission Lines	**Ckm**	**198407**	**257481**	**107454**	**364935**
SUBSTATIONS					
(a) 765 kV	MVA	0	25000	130000	155000
(b) 400 kV	MVA	92942	151027	83345	234372
(c) 230/220 kV	MVA	156497	223774	74491	298265
Total – Substations	***MVA***	**249439**	**399801**	**287836**	**687637**
HVDC					
(a)Bi-pole link capacity	MW	5000	6750	6750	13500
(b) Back-to back capacity	MW	3000	3000	0	3000
Total of (a), (b)	**MW**	**8000**	**9750**	**6750**	**16500**

6.3 DEVELOPMENT OF HVDC SYSTEMS DURING XII PLAN

A summary of development of HVDC systems in India during the XII Plan period is given below:

HVDC Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan i.e. 31.03.2016
HVDC Bipole Line						
Chandrapur-Padghe	± 500kV	MSEB	ckm	1504		1504
Rihand-Dadri	± 500kV	PGCIL	ckm	1634		1634
Talcher-Kolar	± 500kV	PGCIL	ckm	2734		2734
Balia-Bhiwadi(2500MW)	± 500kV	PGCIL	ckm	1580		1580
Mundra-Mohindergarh	± 500kV	Adani	ckm	1980		1980
Biswanath Chariyali - Agra	± 800kV	PGCIL	ckm		3506	3506
TOTAL				**9432**	**3506**	**12938**

HVDC Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan i.e. 31.03.2016
HVDC Bi-pole Transmission Capacity						
Chandrapur-Padghe	bipole	MSEB	MW	1500		1500
Rihand-Dadri	bipole	PGCIL	MW	1500		1500
Talcher-Kolar	bipole	PGCIL	MW	2500		2500
Balia-Bhiwadi	bipole	PGCIL	MW	1250	1250	2500
Mundra-Mohindergarh	bipole	Adani	MW		2500	2500
Biswanath Chariyali - Agra	bipole	PGCIL	MW		1500	1500
TOTAL			**MW**	**6750**	**5250**	**12000**
HVDC Back-to-back Transmission Capacity						
Vindhachal	b-t-b	PGCIL	MW	500		500
Chandrapur	b-t-b	PGCIL	MW	1000		1000
Gazuwaka	b-t-b	PGCIL	MW	1000		1000
Sasaram	b-t-b	PGCIL	MW	500		500
TOTAL			**MW**	**3000**		**3000**
Grand Total			**ckm**	**9432**	**3506**	**12938**
			MW	**9750**	**4000**	**15000**

6.4 DEVELOPMENT OF 765KV SYSTEMS DURING XII PLAN

Up to 10th plan all 765 kV systems in the country were operated at 400kV. Sipat to Seoni was the first system that was operated at 765kV in Sept 2007. This set a new milestone in development of transmission system in the country. A summary of development of 765kV transmission system in India during the XI Plan period is given below:

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
765kV Transmission Lines						
Anpara-Unnao	S/C	UPPCL	ckm	409		409
Kishenpur-Moga L-1(W)	S/C	PGCIL	ckm	275		275
Kishenpur-Moga L-2(E)	S/C	PGCIL	ckm	287		287
Tehri-Meerut Line-1	S/C	PGCIL	ckm	186		186
Tehri-Meerut Line-2	S/C	PGCIL	ckm	184		184
Agra-Gwalior Line-1	S/C	PGCIL	ckm	128		128
Gwalior-Bina Line-1	S/C	GCIL	ckm	235		235
Gaya-Balia	S/C	PGCIL	ckm	228		228
Balia-Lucknow	S/C	PGCIL	ckm	320		320

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
Sipat-Seoni Line-1	S/C	PGCIL	ckm	351		351
Sipat-Seoni Line-2	S/C	PGCIL	ckm	354		354
Seoni – Bina (to be initially op. at 400KV)	S/C	PGCIL	ckm	293		293
Seoni-Wardha line-1 (to be initially op. at 400KV)	S/C	PGCIL	ckm	269		269
Seoni-Wardha line-2 (to be initially op. at 400KV)	S/C	PGCIL	ckm	261		261
Gwalior-Bina Line-2	S/C		ckm	233		233
Agra-Gwalior Line-2 (to be initially op. at 400KV)	S/C	PGCIL	ckm	128		128
LILO of Tehri –Meerut D/C line at Tehri Pooling Point (to be charged at 400kV)	S/C	PGCIL	ckm	21		21
LILO of Sipat - Seoni (2nd Ckt) at WR Pooling station Near Sipat	S/C	PGCIL	ckm	16		16
Sasaram- Fatehpur(Line-1)	S/C	PGCIL	ckm	337		337
Satna-Bina line-1	S/C	PGCIL	ckm	274		274
Bina- Indore	S/C	PGCIL	ckm	311		311
Gaya- Sasaram	S/C	PGCIL	ckm	148		148
Shifting of Anpara-B -Unnao point from Anpara- B to Anpara-C	S/C	UPPCL	ckm	1		1
Shifting of Anpara-B -Unnao termaination point at Unnao	S/C	UPPCL	ckm	1		1
Bhiwani - Moga	S/C	PGCIL	ckm		273	273
Fatehpur- Agra Line I	S/C	PGCIL	ckm		334	334
Satna - Bina line -II	S/C	PGCIL	ckm		276	276
Jhatikara - Bhiwani	S/C	PGCIL	ckm		85	85
Sasan - Satna line -I	S/C	PGCIL	ckm		241	241
Sasan - Vindhyachal Pooling Station line	S/C	PGCIL	ckm		12	12
Agra - Jhatikara	S/C	PGCIL	ckm		252	252
Sasan - Satna line -II	S/C	PGCIL	ckm		242	242
Meerut - Agra	S/C	PGCIL	ckm		268	268
Sasaram - Fatehpur line-II	S/C	PGCIL	ckm		355	355
Fatehpur- Agra line-II	S/C	PGCIL	ckm		334	334
Raigarh Pooling Station (Near Kotra) - Raigarh Pooling Station (Near Tammar) line	D/C	PGCIL	ckm		98	98
Jabalpur Pooling Station - Bina line	D/C	PGCIL	ckm		459	459
Raichur - Sholapur	S/C	PGCIL	ckm		208	208
Meerut - Bhiwani line	S/C	PGCIL	ckm		174	174

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
Raigarh Pooling Station (Near Kotra) - Raipur Pooling Station line	D/C	PGCIL	ckm		480	480
Satna - Gwalior line (Ckt-I)	S/C	PGCIL	ckm		337	337
LILO of Ranchi - WR Pooling Station at Dharamjaygarh / near Korba.	D/C	PGCIL	ckm		10	10
Lucknow - Bareilly line	S/C	PGCIL	ckm		252	252
Ranchi - WR Pooling Station	S/C	PGCIL	ckm		381	381
Tiroda - Akola-II		APL	ckm		361	361
Anta - Phagi (Jaipur South Ckt-2)(Charged at 400 kV)	S/C	RVPNL	ckm		214	214
Anta - Phagi (Jaipur South Ckt-1)	S/C	RVPNL	ckm		212	212
Bina - Gwalior line (3rd Ckt)	S/C	PGCIL	ckm		231	231
Champa Pooling Station - Dharamjaygarh / Near Korba Switching Station line	S/C	PGCIL	ckm		62	62
Champa Pooling Station - Raipur Pooling Station line	D/C	PGCIL	ckm		298	298
Indore - Vadodara	S/C	PGCIL	ckm		320	320
Kurnool - Raichur (IInd Ckt)	S/C	PGCIL	ckm		118	118
Rihand - Vindhyachal Pooling Station (1st Ckt)	S/C	PGCIL	ckm		31	31
Jharsuguda Pooling Station Dharamjaygarh line.	D/C	PGCIL	ckm		300	300
Wardha - Aurangabad-I	D/C	PGCIL	ckm		690	690
Satna - Gwalior line (60 Km D/C Portion) Ckt-II	D/C+ S/C	PGCIL	ckm		300	300
Kurnool - Nellore	D/C	PGCIL	ckm		602	602
Kurnool - Thiruvalam line	D/C	PGCIL	ckm		710	710
Raipur Pooling Station - Wardha line	D/C	PGCIL	ckm		736	736
Sholapur - Pune	S/C	PGCIL	ckm		268	268
Angul Pooling Station - Jharsuguda Pooling Station line-I	S/C	PGCIL	ckm		274	274
Vindhyachal Pooling Station - Satna line (2 Km D/C Portion) Ckt-I	D/C+ S/C	PGCIL	ckm		271	271
Wardha - Aurangabad -II	D/C	PGCIL	ckm		701	701
Raichur - Sholapur line	S/C	RSTCL	ckm		208	208
Akola - Aurangabad line ckt-I	S/C	APL	ckm		219	219

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
Aurangabad - Dhule (BDTCL)	S/C	SGL	ckm		192	192
Bhopal - Indore (BDTCL)	S/C	SGL	ckm		176	176
Dhule - Vadodara (BDTCL)	S/C	SGL	ckm		263	263
Tiroda - Koradi - Akola - Aurangabad line ckt-II	S/C	APL	ckm		575	575
Anpara C - Anpara D	S/C	UPPTCL	ckm		3	3
Sasan - Vindhyachal (PS)	S/C	PGCIL	ckm		6	6
Meerut - Moga line	S/C	PGCIL	ckm		337	337
Raigarh Pooling Station (Near Kotra) - Champa Pooling Station line	S/C	PGCIL	ckm		96	96
Gwalior - Jaipur (Ckt 1)	S/C	PGCIL	ckm		305	305
Gwalior - Jaipur line (Ckt 2)	S/C	PGCIL	ckm		311	311
Jaipur - Bhiwani line	S/C	PGCIL	ckm		272	272
Rihand - Vindhyachal Pooling Station (2nd Ckt)	D/C	PGCIL	ckm		31	31
Vindhyachal Pooling Station - Satna Ckt-II	S/C	PGCIL	ckm		271	271
Aurangabad - Solapur line	D/C	PGCIL	ckm		556	556
Dharamjaygarh - Jabalpur Pooling Station line	D/C	PGCIL	ckm		848	848
Narendra (New, Kudgi) - Kolhapur (new)	D/C	PGCIL	ckm		374	374
Jabalpur - Bhopal (BDTCL)	S/C	SGL	ckm		274	274
Jabalpur - Bina (JTCL)	S/C	SGL	ckm		245	245
Dhramjaygarh - Jabalpur (JTCL)	D/C	SGL	ckm		758	758
Kurnool (New) - Raichur line	D/C	PGCIL	ckm		120	120
Ranchi (New) - Dharamjaygarh /Near Korba	S/C	PGCIL	ckm		341	341
Angul Pooling Station - Jharsuguda Pooling Station line-II	S/C	PGCIL	ckm		284	284
Balia - Varanasi	S/C	PGCIL	ckm		165	165
LILO of Gaya - Fatehpur at Varanasi S/S	S/C	PGCIL	ckm		7	7
TOTAL			**ckm**	**5250**	**19007**	**24257**
765kV Sub-stations						
Seoni Sub station		PGCIL	MVA	1500		1500
Seoni New		PGCIL	MVA	1500		1500
Seoni Extn		PGCIL	MVA	1500		1500
Fatehpur		PGCIL	MVA	3000		3000
Gaya		PGCIL	MVA	3000		3000

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
WR Pooling Station near Sipat		PGCIL	MVA	3000		3000
Balia		PGCIL	MVA	3000		3000
Lucknow		PGCIL	MVA	3000		3000
Wardha		PGCIL	MVA	4500		4500
Unnao		UPPTCL	MVA	1000		1000
Agra Aug.		PGCIL	MVA		1500	1500
Bhiwani. S/S		PGCIL	MVA		1000	1000
Gaya (3rd Transf)		PGCIL	MVA		1500	1500
Moga (Aug.)		PGCIL	MVA		1500	1500
Satna (1st ICT)		PGCIL	MVA		1000	1000
WR Pooling Station near Sipat (Bilaspur) (3rd ICT)		PGCIL	MVA		1500	1500
Agra (ICT-II) S/S		PGCIL	MVA		1500	1500
Bina. S/S		PGCIL	MVA		1000	1000
Moga (ICT-II) S/S		PGCIL	MVA		1500	1500
Satna (2nd ICT)		PGCIL	MVA		1000	1000
Bhiwani ICT -II S/S		PGCIL	MVA		1000	1000
Jhatikara S/S		PGCIL	MVA		6000	6000
Bina (ICT-II) S/S		PGCIL	MVA		1000	1000
Gwalior		PGCIL	MVA		3000	3000
Meerut S/S		PGCIL	MVA		3000	3000
Sasaram (1st Trf.) S/S		PGCIL	MVA		1500	1500
Indore (1st Trf.)		PGCIL	MVA		1500	1500
Indore (2nd Trf.)		PGCIL	MVA		1500	1500
Raigarh Pooling Station (Kotra)		PGCIL	MVA		4500	4500
Raigarh Pooling Station (Near Tamnar) 1st ICT		PGCIL	MVA		1500	1500
Raigarh Pooling Station (Near Tamnar) 2nd ICT		PGCIL	MVA		1500	1500
Jabalpur Pooling Station (Ist ICT)		PGCIL	MVA		1500	1500
Raichur S/S (1st ICT)		PGCIL	MVA		1500	1500
Raichur S/S (2nd ICT)		PGCIL	MVA		1500	1500
Raipur Pooling Station		PGCIL	MVA		1500	1500
Solapur S/S		PGCIL	MVA		3000	3000
Raigarh Pooling Station (Near Tamnar) 3rd ICT		PGCIL	MVA		1500	1500
Raigarh(Kotra) Pooling Stn. (4th ICT)		PGCIL	MVA		1500	1500

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
Jabalpur Pooling Station (2nd ICT)		PGCIL	MVA		1500	1500
Ranchi		PGCIL	MVA		3000	3000
Akola -II S/S		APL	MVA		1500	1500
Tiroda S/S		APL	MVA		1500	1500
Unnao (Phase -II) (2nd Trf.)		UPPTCL	MVA		1000	1000
Dharamjaygarh/ Korba Pooling station		PGCIL	MVA		1500	1500
Kurnool S/S		PGCIL	MVA		3000	3000
Aurangabad ICT-II		PGCIL	MVA		1500	1500
Dharamjaygarh/ Korba Pooling station ICT -II		PGCIL	MVA		1500	1500
Jharsuguda Pooling Station		PGCIL	MVA		1500	1500
Jharsuguda (2nd ICT)		PGCIL	MVA		1500	1500
Nellore I & II - ICT		PGCIL	MVA		3000	3000
Sholapur (GIS) S/S		PGCIL	MVA		3000	3000
Angul Pooling Station. S/S (4x1500)		PGCIL	MVA		1500	1500
Bareilly (ICT-II)		PGCIL	MVA		1500	1500
Thiruvalam S/S (2x1500)		PGCIL	MVA		1500	1500
Vindhyachal Pooling Station (ICT-I)		PGCIL	MVA		1500	1500
Agaria (Bhopal) (2x1500)		SGL	MVA		3000	3000
Dhule S/S (BDTCL) (2x1500)		SGL	MVA		3000	3000
Koradi - III S/S		APL	MVA		3000	3000
Anpara D. S/S		UPPTCL	MVA		1000	1000
Anta (Distt. Banra) Pooling Station		RVPNL	MVA		3000	3000
Phagi (jaipur South) (2x1500) S/S		RVPNL	MVA		3000	3000
Angul (ICT-II)		PGCIL	MVA		1500	1500
Bareilly (ICT-I)		PGCIL	MVA		1500	1500
Thiruvalam S/S		PGCIL	MVA		1500	1500
Angul (ICT-III)		PGCIL	MVA		1500	1500
Champa Pooling Station(ICT-I)		PGCIL	MVA		1500	1500
Vadodara S/S		PGCIL	MVA		3000	3000
Vindhyachal Pooling Station (ICT-II)		PGCIL	MVA		1500	1500
Angul S/S (ICT-IV)		PGCIL	MVA		1500	1500

765kV Transmission Systems				At the end of XI Plan	Addition during XII Plan	At end of XII Plan up to 31.03.2016
Champa Pooling Station ICT-II		PGCIL	MVA		1500	1500
Varanasi (GIS) S/S		PGCIL	MVA		3000	3000
TOTAL			**MVA**	**25000**	**116000**	**141000**

6.5 PROGRESS AND PROGRAMME DURING XII PLAN

In respect of 400kV and 220kV transmission system, the actual achievements during the first four years of the 12th Plan i.e. 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17, are detailed at Annex-6.1, Annex-6.2, Annex-6.3, Annex-6.4 and Annex-6.5 respectively. These include both ISTS and Intra-STS transmission systems. The summary of 12th plan achievements is given below:

6.5.1 Transmission System Addition during 2012-13

During 2012-13 17,013 Ckm of transmission lines (220kV and above) and 63,250 MVA of transformation capacity was commissioned. Special achievement during this year has been completion of 2nd pole at Balia & Bhiwadi converter station and 2500 MW HVDC pole at Mundra & Mohindergarh line. There was 24000 MVA transformation capacity addition at 765 kV during this year. In addition to commissioning of 6 nos. Of new 765 kV lines. Transmission lines and sub-station at 765kV, 400 kV and 220 kV completed during the year 2012-13 are given at Annex 6.1 (A) & (B) respectively.

6.5.2 Transmission System Addition during 2013-14

During 2013-14 around 16,736 Ckm of transmission Lines (220kV and above) and 58,330 MVA Transformation capacity was commissioned. During this year 35500 of transformation capacity at 765 kV level along with 17 nos. Of new 765 kV lines were commissioned. This year also witnessed synchronization of Southern Region with rest of all India Grid i.e Raichur – Sholapur 765 kV line. Transmission lines and sub-station at 765kV, 400 kV and 220 kV completed during the year 2013-14 are given at Annex 6.2 (A) & (B) respectively.

6.5.3 Transmission System Addition during 2014-15

During 2014-15 around 22,098 Ckm of transmission lines (220kV and above) and 65,554 MVA and transformation Capacity was commissioned. Highlights of this year has been strengthening of 765 kV system with Southern Region and Western Region and commissioning of 6 nos. of 765 kV lines under private sector out of 23 nos. of such lines in total. Like the previous, this year also we had good amount of transformation capacity at 765 kV level i.e. addition 38500 MVA. Transmission lines and sub-station at 765kV, 400 kV and 220 kV completed during the year 2014-15 are given at Annex 6.3 (A) & (B) respectively.

6.5.4 Transmission System Addition during 2015-16

During 2015-16, around 28,114 Ckm of transmission lines (220kV and above) and 62,849 MVA of Transformation Capacity was achieved. A major HVDC line with highest voltage level at ± 800 kV from Biswanath Chariyali in Arunachal Pradesh – Agra in Uttar Pradesh was operationalised in this year. The capacity of synchronise link with Southern Region was also enhanced by commissioning of Narendra (New Kudgi) – Kolhapur (new) 765 kV line (operated at 400 kV D/C line). Transmission lines and sub-station at 765kV, 400 kV and 220 kV completed during the year 2015-16 are given at Annex 6.4 (A) & (B) respectively.

6.5.5 Transmission System Addition during 2016-17

During 2016-17, around 20,556 Ckm of transmission lines (220kV and above) and 49,210 MVA of Transformation Capacity is expected to be achieved. Transmission lines and sub-station at 765kV, 400 kV and 220 kV that are likely to be completed during this period of 12th plan, are given at Annex-6.5 (A) & (B) respectively.

6.6 DEVELOPMENT OF INTER-REGIONAL TRANSMISSION CAPACITY DURING THE XII PLAN

6.6.1 Progress and achievement at the end of 12th Plan

At the end of the 11th Plan, the inter-regional transmission capacity at 132kV and above was 27,750 MW. During the period of XII Plan, (April 2012 to March, 2016), 29,700 MW of inter-regional transmission capacity has been added, taking the total inter-regional transmission capacity (at voltage level 132kV and above) to 57,450 MW as on 31-03-2016. (This includes (i) 2100 MW Sasaram - Fatehpur 765kV S/C line#2 and (ii) 2100 MW Ranchi – WR(Bilaspur) Sipat Pooling Point 765kV S/C via Dharamjaigarh. (iii)4200 MW Jharsuguda - Dharamjaigarh-765kV D/C. (iv) 2100 MW Agra-Gwalior 765kV S/C line-1 at 765 kV (earlier at 400kV) (v) 2100 MW Agra-Gwalior 765kV S/C line-2 at 765kV (earlier at 400kV). (vi) 2100 MW Gwalior-Jaipur 765kV S/C#1 (vii) 2100 MW Gwalior-Jaipur 765kV S/C#2. (viii) 2200 MW Narendra (GIS) – Kolhapur (new) 765kV D/C line (initially charged at 400 kV). (ix) 2100 MW Raichur-Sholapur 765kV S/C #1. (x) 2100 MW Ranchi- Dharamjaigarh 765kV S/C (xi) 2100 MW Raichur-Sholapur 765kV S/C #2. (xi) 3000 MW HVDC bipole Bishwanath Chariyali – Agra +800kV out of which 1500 MW has been commissioned.)

Details of the inter-regional capacity up to the end of 12th plan are given below:

(Transmission capacity in MW)

	Present **(as on Nov 2016)**	Addition in **rest of 12th** Plan	Capacity **expected** at the End of **12th** Plan
EAST-NORTH			
Dehri-Sahupuri 220 kV S/c	130		130
Sasaram HVDC back-to-back	500		500
Muzaffarpur-Gorakhpur 400 kV D/c (with Series Cap+TCSC)	2000		2000
Patna – Balia 400kV D/c (Quad)	1600		1600
Biharshariff – Balia 400kV D/c(Quad)	1600		1600
Barh – Balia 400kV D/c (Quad)	1600		1600
Gaya - Balia 765kV S/c	2100		2100
Sasaram bypassing(additional capacity)	500		500
Sasaram - Fatehpur 765kV S/c	2100		2100
Barh-II-Gorakhpur 400kV D/c (Quad) line	1600		1600
Gaya-Varanasi 765 kV 2xS/c line	4200		4200
Biharsharif-Varanasi 400kV D/c line (Quad)	1600	0	1600
LILO of Biswanath Chariali - Agra +/- 800 kV, 3000 MW HVDC Bi-pole at new pooling station in Alipurduar and addition of second 3000 MW module		1500	1500
Sub-total	**19530**	**1500**	**21030**
EAST-WEST			
Budhipadar-Korba 220 kV 3 ckts.	390		390
Rourkela-Raipur 400 kV D/c with series comp.+TCSC	1400		1400
Ranchi –Sipat 400 kV D/c with series comp.	1200		1200
Rourkela-Raipur 400 kV D/c (2nd) with series comp.	1400		1400
Ranchi - Dharamjayagarh - WR Pooiling Station 765kV S/c line	2100		2100

	Present (as on Nov 2016)	Addition in rest of 12th Plan	Capacity expected at the End of 12th Plan
Ranchi - Dharamjaygarh 765kV 2nd S/c	2100		2100
Jharsuguda-Dharamjaygarh 765kV D/c line	4200		4200
Jharsuguda-Dharamjaygarh 765kV 2nd D/c line			
Jharsuguda - Raipur Pool 765kV D/c line			0
Sub-total	**12790**	**0**	**12790**
WEST- NORTH			
Auriya-Malanpur 220 KV D/c	260		260
Kota - Ujjain 220 KV D/c	260		260
Vindhyachal HVDC back-to-back	500		500
Gwalier-Agra 765 kV 2 x S/c	4200		4200
Zerda-Kankroli 400kV D/c	1000		1000
Gwalior-Jaipur 765kV 2xS/c lines	4200		4200
Adani(Mundra) - Mahendranagar HVDC bipole	2500		2500
RAPP-Sujalpur 400kV D/c	1000		1000
Champa Pool- Kurukshetra HVDC Bipole		3000	3000
Upgradation of Champa Pool-Kurukshetra HVDC Bipole			
Jabalpur - Orai 765kV D/c line			
LILO of Satna - Gwalior 765kV S/c line at Orai			
Banaskantha-Chittorgarh 765kV D/c line			
Vindhyachal-Varanasi 765kV D/c line			
Sub-total	**13920**	**3000**	**16920**
EAST- SOUTH			
Balimela-Upper Sileru 220kV S/c	130		130
Gazuwaka HVDC back-to-back	1000		1000
Talcher-Kolar HVDC bipole	2000		2000
Upgradation of Talcher-Kolar HVDC Bipole	500		500
Angul - Srikakulum		4200	4200

	Present (as on Nov 2016)	Addition in rest of 12th Plan	Capacity expected at the End of 12th Plan
Sub-total	**3630**	**4200**	**7830**
WEST- SOUTH			
Chandrapur HVDC back-to-back	1000		1000
Kolhapur-Belgaum 220kV D/c	260		260
Ponda – Nagajhari 220kV D/c	260		260
Raichur - Sholapur 765kV S/c line (PG)	2100		2100
Raichur - Sholapur 765kV S/c line (Pvt. Sector)	2100		2100
Narendra - Kolhapur 765kV D/c (ch at 400kV)	2200		2200
Wardha - Hyderabad 765kV D/c line			
Warora Pool - Warangal (New) 765kV D/c line			
Raigarh-Pugulur HVDC line			
LILO of Narendra-Narendra(New) 400kV (quad) line at Xeldam (Goa)			
Sub-total	**7920**	**0**	**7920**
EAST- NORTH EAST			
Birpara-Salakati 220kV D/c	260		260
Malda - Bongaigaon 400 kV D/c	1000		1000
Siliguri - Bongaigaon 400 kV D/c (Quad) line	1600		1600
Sub-total	**2860**	**0**	**2860**
NORTH EAST-NORTH			
Biswanath Chariali - Agra +/- 800 kV, 3000 MW HVDC Bi-pole$	3000	0	3000
Sub-total	**3000**	**0**	**3000**
TOTAL	**63,650**	**8,700**	**72,350**

6.6.2 Planned v/s Achieved I-R capacity in 11th Plan

The transmission capacity of Inter-Regional links planned to be achieved by end of 12th Plan is 68050 MW. As on 30.11.2015 Inter-regional transmission capacity is 55350 MW. (i) 2100 MW Gaya-Varanasi 765kV S/C and (ii) 1000

MW RAPP C&D- Shujalpur 400kV D/C (iii) 3000 MW Champa-Kurukshetra ±800kV 6000MW HVDC bipole line, Ph.-I (iv) 1500 MW Bishwanath Chariyali – Agra ±800kV, 3000 MW HVDC bipole. (v) 3000 MW LILO of ±800kV Bishwanath Chariyali – Agra HVDC Bipole at new pooling station in Alipurduar and addition of second 3000 MW HVDC are expected to come during the remaining period up to the end of 12th Plan.

6.7 CHALLENGES IN IMPLEMENTATION OF XII PLAN

6.7.1 Challenges

Transmission projects are planned along with the upcoming generation projects and any delay/mismatch in commissioning of associated evacuation lines may result in bottling up of power. For some of the transmission works, implementing agencies face challenges in completion of the task. Main challenges are: delay in forest clearance, right of way problems and challenges in acquiring land for substations. Details of transmission line projects (220kV and above) under execution where major forest clearance problems were encountered by implementing agencies (as observed during the XI Plan) are given at Annex - 6.6.

6.7.2 Forest Clearance

Forest Clearance is a mandatory requirement for the portion of the line traversing through the forest. While finalizing the route alignment emphasis is on avoidance of forest, National Parks, Wildlife Sanctuary etc., however, it is not possible to avoid such areas completely. Getting Forest Clearance takes considerable time due to lengthy process and involvement of different levels. The Project Authorities are facing problems in getting the consent of Gram Sabhas which has been made compulsory under Forest Act 2006. Even the State Governments take lot of time in forwarding the proposal to MOEF for further clearances.

6.7.3 Right of Way (RoW)

With increase in transmission voltage, the requirement of land for tower footing and RoW has increased substantially. Despite adoption of latest technological solutions to optimize the RoW requirements, difficulties in getting RoW results in delay in implementation of transmission projects. Norms for evaluation and fixing of compensation for RoW vary from state to state.

6.7.4 Land for Substations:

The land for substations is normally government land or private land acquired through Land Acquisition Act 1984. While doing town planning for new suburban area and industrial centers, provision for laying of substation and transmission line should be kept in mind. To reduce the requirement of land for constructing substation use of Gas Insulated Substations (GIS) which requires about 30 % land compared to conventional substation is being increasingly adopted in metro, hilly and other urban areas.

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Annex-6.1 (A)

Transmission Lines Completed During - 2012-2013

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
1	2	3	4	5	6
765 kV					
CENTRAL SECTOR					
1	Bhiwani - Moga	S/C	PGCIL	273	MAY-12
2	Fatehpur- Agra Line I	S/C	PGCIL	334	MAY-12
3	Satna - Bina line -II	S/C	PGCIL	276	JUN-12
4	Jhatikara - Bhiwani	S/C	PGCIL	85	SEP-12
5	Sasan - Satna line -I	S/C	PGCIL	241	DEC-12
6	Sasan - Vindhyachal Pooling Station line	S/C	PGCIL	12	DEC-12
Total of CENTRAL Sector				**1221**	
Total of 765 kV				**1221**	
66 kV					
STATE SECTOR					
7	Nimoo S/S - Alachi S/S	S/C	JKPDD	17	SEP-12
8	Leh (C.P.) - Leh S/S	S/C	JKPDD	7	DEC-12
Total of STATE Sector				**24**	
Total of 66 kV				**24**	
400 kV					
CENTRAL SECTOR					
9	Durgapur-Jamshedpur (Part Line)	D/C	PGCIL	276	APR-12
10	Jamshedpur - Baripada (Part Line)	D/C	PGCIL	220	APR-12
11	Manesar - Neemrana	D/C	PGCIL	134	MAY-12
12	Mauda - Wardha (2nd Ckt)	S/C	PGCIL	124	MAY-12
13	Nabinagar - Sasaram line (Twin lapwing)	D/C	PGCIL	164	MAY-12
14	LILO of Agra - Jaipur line at Jaipur (Part Line)	D/C	PGCIL	75	JUN-12
15	LILO of one ckt Balia - Lucknow at Sohawal	D/C	PGCIL	12	JUN-12
16	Palatana - Surajmaninagar line (Charged at 132 KV)	D/C	PGCIL	74	JUN-12
17	Gandhar - Navsari	D/C	PGCIL	204	JUL-12
18	LILO of both Ckt of Allahabad - Mainpuri at Fatehpur	2xD/C	PGCIL	73	JUL-12
19	LILO of both ckt of Bawana /Bahadurgarh -Hissar at Bhiwani	D/C	PGCIL	60	JUL-12

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
20	Gurgaon -Manesar(Q)	D/C	PGCIL	34	AUG-12
21	LILO of Both Ckt of Agra - Jaipur line at Jaipur (Ckt-II)	D/C	PGCIL	75	AUG-12
22	LILO of Both ckt Bahadurgarh - Hissar at Bhiwani	D/C	PGCIL	33	AUG-12
23	LILO of Meramundli - Jeypore line at Bolangir	S/C	PGCIL	42	AUG-12
24	LILO of both ckt of Udumalpet - Madakathara at Chulliar (Ckt-II)	D/C	PGCIL	49	AUG-12
25	Mundra - Jetpur (Part line)	S/C	PGCIL	314	AUG-12
26	LILO of both ckt of Mundka/Bawana - Bamnouli at Jhatikara (Q)	D/C	PGCIL	26	SEP-12
27	LILO of One Ckt of Bareilly - Mandola line at Meerut	D/C	PGCIL	110	SEP-12
28	LILO of Barh - Balia at Patna	D/C	PGCIL	16	NOV-12
29	LILO of Kahalgaon - Biharshariff line (2nd line) at Banka	D/C	PGCIL	56	NOV-12
30	Bongaigaon TPS - Bongaigaon	D/C	PGCIL	6	DEC-12
31	Mundra - Jetpur (Balance portion)	S/C	PGCIL	358	DEC-12
32	Raipur(PG) - Wardha(PG)	D/C	PGCIL	741	DEC-12
33	Sasan - Vindhyachal Pooling station	D/C	PGCIL	12	DEC-12
34	Vindhyachal-IV - Vindhyachal Pooling Station line (Q)	D/C	PGCIL	58	DEC-12
35	Bina - Bina (MPPTCL)	D/C	PGCIL	1	JAN-13
36	LILO of Both Ckt-II Balia - Lucknow line at Sohawal	D/C	PGCIL	12	JAN-13
37	LILO of Rengali - Baripada line at Keonihar	S/C	PGCIL	18	JAN-13
38	Maithon - Koderma line (Contingency combining M-G and K-G and by passing common MC portion &Gaya S/S)	D/C	PGCIL	526	JAN-13
39	Bhiwani - Jind line	D/C	PGCIL	165	MAR-13
40	Chamera-II HEP - Jullandur line	D/C	PGCIL	324	MAR-13
41	Kishanpur - Samba line	D/C	PGCIL	70	MAR-13
42	LILO of 2nd Ckt Bareilly - Mandola line at Meerut	S/C	PGCIL	112	MAR-13
43	LILO of Kaithalguri - Misa line at Mariani (New) (Charged at 220KV)	D/C	PGCIL	1	MAR-13
44	LILO of Both Ckt SEPL/MEPL - Nellore at Nellor Pooling Station	D/C	PGCIL	15	MAR-13
45	LILO of Meramundli -Jeypore line at Angul Pooling Station	D/C	PGCIL	9	MAR-13
46	LILO of Rourkela - Raigarh at Jharsuguda Pooling Stn.	D/C	PGCIL	44	MAR-13
47	Nellore - Gooty line	D/C	PGCIL	578	MAR-13
48	Raipur Pooling Station - Raipur line	D/C	PGCIL	43	MAR-13

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
49	Vallure TPS - Melakottaiyur line	D/C	PGCIL	71	MAR-13
50	Vapi - Navsari line	D/C	PGCIL	236	MAR-13
Total of CENTRAL Sector				**5571**	
PVT SECTOR					
51	LILO of Lonikhand - Kalwa at Pune (2n Ckt)	S/C	RPTL	3	MAY-12
52	Kasaipalli TPP -Bharai (Sipat) Pooling station	D/C	ACB	112	JUL-12
53	Adhunik - Jamshedupur (PG) (Padampur)	D/C	ADHUNIK	1	JUL-12
54	Mohindergarh HVDC - Bhiwani	D/C	APL	100	JUL-12
55	Mohindergarh HVDC- Mohindergarh HVPNl (Dhanonda)	D/C	APL	10	JUL-12
56	Karcham Wangtoo-Abdullapur	D/C	JV(PG&JP)	432	JUL-12
57	Solapur (PG) - Kolhapur (MSETCL)	D/C	RPTL	440	JUL-12
58	LILO of one ckt Korba- Birsinghpur at Vandana	D/C	VVL	6	JUL-12
59	Tiroda TPP - Warora (2nd ckt)	D/C	APL	218	AUG-12
60	Palatana -Silchar	D/C	NETC	495	AUG-12
61	LILO of Koradi -Akola at Amravati	D/C	IBPL	14	OCT-12
62	EMCO - Bhadrawathi (PG)	D/C	GMR ENERG	80	JAN-13
63	Silchar - Byrnihat	D/C	NETC	428	FEB-13
64	Tiroda TPP -Warora (1st ckt)	S/C	APL	218	MAR-13
65	Gandhar-Hazira	D/C	EPTCL	208	MAR-13
66	LILO of Viindhyachal -Korba line at Mahan S/S	D/C	EPTCL	44	MAR-13
Total of PVT Sector				**2809**	
STATE SECTOR					
67	Lonikand -I -Lonikand II	S/C	MSETCL	1	MAY-12
68	Warora - Wardha (1st Ckt)	S/C	MSETCL	78	MAY-12
69	LILO of Kolaghat TPS - Baripada at Kharagpur	D/C	WBSETCL	8	JUN-12
70	Nandikur (UTPS) - Shantigrama (Hassan)	D/C	KPTCL	358	AUG-12
71	Koradi (Old)- New Khaperkheda	S/C on D/C	MSETCL	4	AUG-12
72	Vallur JV Project-NCTPS St.II	D/C	TANTRANSCO	7	AUG-12
73	LILO Korba (West)-Bhilai at Raipur (CSPTCL)	D/C	CSPTCL	47	SEP-12
74	Krishnapatnam TPS - Nellore.	D/C	APTRANSCO	72	NOV-12
75	LILO of samayapur-Greate Noida at Nawada	D/C	HVPNL	1	NOV-12
76	Korba (W)-Bhilai (khedamara)	D/C	CSPTCL	447	DEC-12
77	Chhabra TPS-Kawai SCTPS	S/C	RVPNL	16	DEC-12

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
78	Daultabad -Dhanonda	D/C	HVPNL	146	JAN-13
79	Warora-Wardha(2nd Ckt)	S/C	MSETCL	76	JAN-13
80	Talwandi Sabo - Dhuri	D/C	PSTCL	175	JAN-13
81	Jodhpur - Merta (2nd Ckt) line	D/C	RVPNL	98	JAN-13
82	MTPS St.III - Arasur	D/C	TANTRANSCO	220	JAN-13
83	NCTPS St.II- Alamathy 400 kV S/S	M/C	TANTRANSCO	136	JAN-13
84	Malkaram-Narsapur	D/C	APTRANSCO	147	FEB-13
85	Narsapur-Suryapet	D/C	APTRANSCO	149	FEB-13
86	Vijayawada TPS-Suryapeta	D/C	APTRANSCO	226	FEB-13
87	Malwa TPP - Chhegaon	D/C	MPPTCL	105	FEB-13
88	UKai-Kosamba	D/C	GETCO	145	MAR-13
89	LILO of Palatana - Bongaigaon at Killing (Byrnihat)	D/C	MeECL	9	MAR-13
90	Talwandi Sabo - Moga	D/C	PSTCL	204	MAR-13
Total of STATE Sector				**2875**	
Total of 400 kV				**11255**	
220 kV					
CENTRAL SECTOR					
91	LILO of Sikar (RVPN)-RAtnagarh at Sikar (2nd LILO)	D/C	PGCIL	6	APR-12
92	LILO of both ckts of Kawas-Navsari at Navsari.	D/C	PGCIL	82	JUL-12
93	Kalpakkam PFBR-Kanchepurram	D/C	PGCIL	160	AUG-12
94	Dhanbad-Giridih	D/C	DVC	86	MAR-13
Total of CENTRAL Sector				**334**	
STATE SECTOR					
95	Madhavanahally S/S - Chamarajanagar S/S	D/C	KPTCL	83	APR-12
96	Mannukkad (Chulliar) - Kanjikode (Palakkad) 2nd D/C	M/C	KSEB	12	APR-12
97	LILO of Padghe-Boisar (PG) at Vasai S/S	D/C	MSETCL	5	APR-12
98	LILO one ckt of Lalton Kalan-Sahnewal at Ludhiana (PG)	D/C	PSTCL	7	APR-12
99	Kalisindh-Jhalawar line	D/C	RVPNL	19	APR-12
100	LILO of Halvad-Morbi I at Bhachau	D/C	GETCO	217	MAY-12
101	LILO of Halvad-Morbi II at Bhachau	D/C	GETCO	216	MAY-12
102	East Div Compound - Nimhans Station	UG Cable	KPTCL	5	MAY-12
103	Pakhowal - Mehal Kalan	S/C	PSTCL	58	MAY-12

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
104	Sarnath-Gajokhar	S/C on D/C	UPPTCL	30	MAY-12
105	LILO of Ramagundam - Dichpally at Medaram	D/C	APTRANSCO	10	JUN-12
106	LILO of Ramagundam - Nirmal at Vemnur	D/C	APTRANSCO	2	JUN-12
107	Tharad-Thavar line	D/C	GETCO	98	JUN-12
108	Gurgaon Sector - 72 - Gurgaon Sector - 56	D/C	HVPNL	21	JUN-12
109	Gurgaon Sector-72- Gurgaon Sector-52 A	D/C	HVPNL	23	JUN-12
110	Khaperkheda (New) - Khaperkheda	M/C	MSETCL	12	JUN-12
111	LILO of Kalwa - Ghatghar at Bapgaon	D/C	MSETCL	4	JUN-12
112	LILO of Osmanabad - Barshi at Paranda	D/C	MSETCL	74	JUN-12
113	Loc 13 of Butibori I -Butibori II - Butibori TPS	S/C	MSETCL	1	JUN-12
114	Old Butibori I-Buttibori -III	D/C on M/C	MSETCL	2	JUN-12
115	Kapurthala - 400 kV Jalandhar line	S/C on D/C	PSTCL	24	JUN-12
116	Khushkhera-Neemrana line	S/C	RVPNL	53	JUN-12
117	LILO of RTPP - ATP at Thimmapuram	D/C	APTRANSCO	5	JUL-12
118	Kochin East (Pallikara) - Marakkala line	M/C	KSEB	9	JUL-12
119	LILO of Sultanpur - Patti at Chola Sahib.	D/C	PSTCL	10	JUL-12
120	Bhilwara - M/s. Jindal Saw	S/C	RVPNL	2	JUL-12
121	LILO of Sanganer -Heerapura line at Mansarovar	D/C	RVPNL	5	JUL-12
122	LILO of one ckt Khushkhera - Neemrana line at Neemrana (Pg)	D/C	RVPNL	5	JUL-12
123	LILO of one ckt of KTPS - Gulabpura at Bundi	D/C	RVPNL	8	JUL-12
124	LILO of Allahabad (Ald)(PG) - Phoolpur at Jhusi	D/C	UPPTCL	13	JUL-12
125	LILO of Savarkundla - Mahva (otha) at Pipavav (GPPC) (line-2)	D/C	GETCO	81	AUG-12
126	LILO of both ckt Mayyar (PGCIL) - Isherwal at Sagwan	D/C	HVPNL	68	AUG-12
127	Beed-Patoda	D/C	MSETCL	86	AUG-12
128	LILO of Vita -Pandhrapur line at Hiwarwadi S/S	D/C	MSETCL	12	AUG-12
129	Bottianwala-Masterwala line	S/C on D/C	PSTCL	24	AUG-12
130	Dhuri - Nabha	S/C	PSTCL	20	AUG-12
131	Goindwal Sahib - Sultanpur Lodhi	D/C	PSTCL	38	AUG-12
132	Suratgarh - Padampur	S/C	RVPNL	57	AUG-12

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
133	Kavanur - Karaikudi	S/C on D/C	TANTRANSCO	82	AUG-12
134	LILO of NCTPS - Mosur at Athipattu	D/C	TANTRANSCO	4	AUG-12
135	LILO of TTPS - Tuticorin at Tuticorin JV	D/C	TANTRANSCO	1	AUG-12
136	Charla - Section of (Muzaffarnagar - Modipuram II)	S/C	UPPTCL	12	AUG-12
137	Kondapuram- Thimmapuram	D/C	APTRANSCO	19	SEP-12
138	LILO of Agia - Sarusajai line at Kukurmara S/S	D/C	AEGCL	4	SEP-12
139	LILO of Fatwa- Khagaul at Sipara (2nd Ckt)	D/C	BSEB	19	SEP-12
140	LILO of DCRTPP - Abdullapur at Rampur Kamboan	D/C	HVPNL	38	SEP-12
141	LILO of Tepla - Madanpur at Raiwali	D/C	HVPNL	8	SEP-12
142	Kanhan - Umred (2nd Ckt)	S/C	MSETCL	50	SEP-12
143	Dechu - Phalodi	D/C	RVPNL	71	SEP-12
144	LILO of Hindaun - Dausa at Sikrai (GSS)	S/C	RVPNL	19	SEP-12
145	Udyogvihar - Hanumangarh	S/C	RVPNL	48	SEP-12
146	LILO of Renigunta - Chittoor at Nagari	D/C	APTRANSCO	75	OCT-12
147	LILO of Pithampur-Indore & Pithampur-Badnagar line at Pithampur 400 KV S/S	D/C	MPPTCL	65	OCT-12
148	Jalna-Chikhali (2nd Ckt)	S/C	MSETCL	75	OCT-12
149	Parli TPS-Nanded (waghala)	M/C	MSETCL	181	OCT-12
150	LILO of Wadala Granthian - Verpal at Udhoke	D/C	PSTCL	6	OCT-12
151	Sahnewal - Doraha	D/C	PSTCL	16	OCT-12
152	LILO of 2nd ckt of Mechal - Minpur at Gajwel	D/C	APTRANSCO	81	NOV-12
153	Hadala - Halvad line	D/C	GETCO	170	NOV-12
154	Tharad-Deodar line	D/C	GETCO	77	NOV-12
155	Nawada - A5	S/C	HVPNL	6	NOV-12
156	Rangala Raipur-Palwal line	D/C	HVPNL	102	NOV-12
157	LILO of Hoody - Somanahalli at HSR layout	D/C	KPTCL	4	NOV-12
158	LILO of Amarkantak - Korba at Anooppur	D/C	MPPTCL	16	NOV-12
159	LILO of Karad Pedambe at Dasgaon	D/C	MSETCL	8	NOV-12
160	LILO of Satara MIDC - Vankuswade at Ajinkyatara SSk ltd.	D/C	MSETCL	8	NOV-12
161	Mhindra - Brldgestone	D/C	MSETCL	12	NOV-12
162	LILO of Mandawar - Bharatpur at Nadbai (GSS)	D/C	RVPNL	11	NOV-12
163	Muzaffarnagar - Modipuram (II Ckt)	S/C	UPPTCL	36	NOV-12

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
164	Jodhpur - Karwad / Bhawad	D/C	RVPNL	78	DEC-12
165	Marwa - Banari (Start up power)	D/C	CSPTCL	28	JAN-13
166	Naggal (PGCIL) - Raiwali	D/C	HVPNL	25	JAN-13
167	Satpura - Pandhurma line (2 Ckt)	S/C	MPPTCL	83	JAN-13
168	Sidhi - Mahan (M/s. Hindalco.) line	S/C	MPPTCL	79	JAN-13
169	New Bhusaval S/S - existing 400 kV Khadka	D/C on M/C	MSETCL	18	JAN-13
170	South Solarpur (PG) - South Solarpur (2nd ckt)	S/C	MSETCL	5	JAN-13
171	Talegaon - M/s. General Motors line	S/C	MSETCL	1	JAN-13
172	Urse - Talegaon line	S/C	MSETCL	9	JAN-13
173	LILO of Gobingarh -Malerkotla line at Ikolaha	D/C	PSTCL	13	JAN-13
174	LILO of both ckts Sunam - Dhuri at Dhuri	D/C	PSTCL	52	JAN-13
175	Bikaner - Gajner	D/C	RVPNL	117	JAN-13
176	Teesta LD III-New Jalpaiguri	S/C	WBSETCL	81	JAN-13
177	LILO of Gachibowli - Yeddumialaram at Yeddumialaram	D/C	APTRANSCO	12	FEB-13
178	Jurala Hydel Plant - Raichur	D/C	KPTCL	98	FEB-13
179	LILO of Khaperkheda - Kanhan II at M/s Suryalaxmi cotton Mills	D/C	MSETCL	6	FEB-13
180	Mandawar -Alwar MIA line	S/C	RVPNL	57	FEB-13
181	Kosamba-Mobha line	D/C	GETCO	178	MAR-13
182	Tharad-Kintech	D/C	GETCO	175	MAR-13
183	LILO Kishenpur-Pampore at Ramban	D/C	JKPDD	4	MAR-13
184	Miran Sahib - Bishnah	D/C	JKPDD	19	MAR-13
185	LILO of Guttur - Ittagi at Neelagunda S/s.	D/C	KPTCL	7	MAR-13
186	Marakkala - Brahmapuram line	M/C	KSEB	17	MAR-13
187	Raigarh - Common Point near Pithampur (Diversion)	D/C	MPPTCL	3	MAR-13
188	Kolhapur-Sawantwadi (2nd Ckt)	S/C	MSETCL	122	MAR-13
189	LILO of Chichwad - Theur at Khadakwasla (Nanded city)	D/C	MSETCL	5	MAR-13
190	Lonand - Bothe (Ckt-II)	S/C	MSETCL	41	MAR-13
191	Paras - Balapur	D/C on M/C	MSETCL	24	MAR-13
192	LILO of GGSSTP - Kohara at Gaunsgarh.	D/C	PSTCL	33	MAR-13
193	LILO of Khassa - Civil lines ASR at Chogawan	D/C	PSTCL	20	MAR-13
194	Barheni-Patnagar (2nd Ckt)	S/C	PTCUL	35	MAR-13
195	LILO of Bhilwara - Chittorgarh at Hamirgarh	D/C	RVPNL	15	MAR-13

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
Total of STATE Sector				**4203**	
Total of 220 kV				**4537**	
132 kV					
CENTRAL SECTOR					
196	Silchar - Badarpur (PG) line.	D/C	PGCIL	38	APR-12
Total of CENTRAL Sector				**38**	
STATE SECTOR					
197	Surajmani Nagar - Budhujngnagar	D/C	TSECL	36	AUG-12
Total of STATE Sector				**36**	
Total of 132 kV				**74**	
110 kV					
STATE SECTOR					
198	BKB-III Common point - BKB-II line	S/C	TANTRANSCO	22	JUN-12
199	BKB-II - Common Point line	D/C	TANTRANSCO	15	AUG-12
200	BKB-II Common point - Pallipalayam line	S/C	TANTRANSCO	2	AUG-12
201	BKB-II Common point - Thirucengode line	S/C	TANTRANSCO	9	AUG-12
202	BKB-III - Common point line.	D/C	TANTRANSCO	6	AUG-12
203	BKB-III Common point - Nallur line	S/C	TANTRANSCO	10	AUG-12
204	LILO of Mettupalayam - Irumborai line at BKB-II	D/C	TANTRANSCO	4	SEP-12
Total of STATE Sector				**68**	
Total of 110 kV				**68**	

Annex-6.1 (B)

Sub-stations Completed During - 2012-2013

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
±500 kV					
CENTRAL SECTOR					
1	Balia & Bhiwadi convertor Stn. (Pole-II)	±500	PGCIL	1250	JUN-12
Total of CENTRAL Sector				1250	
PVT SECTOR					

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
2	Mundra & Mohindergarh (HVDC converter stn.) both poles	±500	APL	2500	MAR-13
Total of PVT Sector				2500	
Toatl of ±500 kV				3750	
765 kV					
CENTRAL SECTOR					
3	Agra Aug.	765/400	PGCIL	1500	MAY-12
4	Bhiwani. S/S	765/400	PGCIL	1000	MAY-12
5	Gaya (3rd Transf)	765/400	PGCIL	1500	MAY-12
6	Moga (Aug.)	765/400	PGCIL	1500	MAY-12
7	Satna (1st ICT)	765/400	PGCIL	1000	JUN-12
8	WR Pooling Station near Sipat (Bilaspur) (3rd ICT)	765/400	PGCIL	1500	JUL-12
9	Agra (ICT-II) S/S	765/400	PGCIL	1500	AUG-12
10	Bina. S/S	765/400	PGCIL	1000	AUG-12
11	Moga (ICT-II) S/S	765/400	PGCIL	1500	AUG-12
12	Satna (2nd ICT)	765/400	PGCIL	1000	AUG-12
13	Bhiwani ICT -II S/S	765/400	PGCIL	1000	SEP-12
14	Jhatikara S/S	765/400	PGCIL	6000	SEP-12
15	Bina (ICT-II) S/S	765/400	PGCIL	1000	MAR-13
16	Gwalior	765/400	PGCIL	3000	MAR-13
Total of CENTRAL Sector				24000	
Toatl of 765 kV				24000	
400 kV					
CENTRAL SECTOR					
17	Jaipur (South)	400/220	PGCIL	500	MAY-12
18	Manesar (GIS)	400/220	PGCIL	500	MAY-12
19	Misa (2nd ICT)	400/220	PGCIL	315	JUN-12
20	Sohawal	400/220	PGCIL	630	JUN-12
21	Manesar (GIS) ICT-II	400/220	PGCIL	500	JUL-12
22	Navsari GIS	400/220	PGCIL	630	JUL-12

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
23	Bolangir (1st Trf.)	400/220	PGCIL	315	AUG-12
24	Bolangir (2nd Trf.)	400/220	PGCIL	315	OCT-12
25	Banka S/S(1st Trf.)	400/132	PGCIL	200	NOV-12
26	Bhiwani. S/S (1st Trf.)	400/220	PGCIL	315	NOV-12
27	Jaipur (South, 2nd Trf.)	400/220	PGCIL	500	NOV-12
28	Banka S/S (2nd Trf.)	400/132	PGCIL	200	DEC-12
29	Bhiwani. S/S (2nd Trf.)	400/220	PGCIL	315	JAN-13
30	Kenonjhar	400/220	PGCIL	315	JAN-13
31	Vapi (ICT) S/S	400/220	PGCIL	315	JAN-13
32	Keonjhar (2nd Trf.)	400/220	PGCIL	315	FEB-13
33	Bidadi (2nd Trf) S/S	400/220	PGCIL	500	MAR-13
34	Samba (With 80 MVAR B. Reactor)	400/220	PGCIL	630	MAR-13
Total of CENTRAL Sector				7310	
STATE SECTOR					
35	Dhanoda (Mohindergarh)	400/220	HVPNL	315	APR-12
36	Lonikhand-II (1st Trf.)	400/220	MSETCL	500	JUN-12
37	Arambag(Aug.)	400/220	WBSETCL	315	JUN-12
38	Kharagpur (1st Trf.)	400/220	WBSETCL	315	JUL-12
39	Girwali (Parli) S/S	400/220	MSETCL	500	AUG-12
40	Kolhapur S/S	400/220	MSETCL	500	AUG-12
41	Lonikand II (2nd Trf.)	400/220	MSETCL	500	AUG-12
42	kharagpur(2nd Trf.)	400/220	WBSETCL	315	OCT-12
43	Shankarapally (Yeddumailaram)1st (Trf.)	400/220	APTRANSCO	315	NOV-12
44	Dhanonda (Mohindergarh) (2nd Trf.)	400/220	HVPNL	315	NOV-12
45	Padghe S/S	400/220	MSETCL	600	NOV-12
46	Chhegaon S/S	400/220	MPPTCL	315	DEC-12
47	Gajwel (Addl. Trf)	400/220	APTRANSCO	100	JAN-13
48	Malkaram (Addl. Trf)	400/220	APTRANSCO	100	JAN-13

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
49	Nawada(1st Trf.)	400/200	HVPNL	315	JAN-13
50	Dhuri (2x500)	400/220	PSTCL	1000	JAN-13
51	Warora (New) S/S	400/220	MSETCL	500	FEB-13
52	Killing (Byrnihat) (Ist Trf.)S/S	400/220	MeECL	315	FEB-13
53	Azamgarh (Aug.)	400/132	UPPTCL	75	FEB-13
54	Shankarapally (Yeddumailaram)2nd & 3rd (Trf.)	400/220	APTRANSCO	630	MAR-13
55	Nerul S/S	400/220	MSETCL	0	MAR-13
56	Warora S/S	400/220	MSETCL	500	MAR-13
57	Sunguvarchatram (Add.Trf)	400/110	TANTRANSCO	200	MAR-13
58	Jeerat (Aug.)	400/220	WBSETCL	315	MAR-13
Total of STATE Sector				8855	
Toatl of 400 kV				16165	
220 kV					
CENTRAL SECTOR					
59	Girdih (1st Trf.) S/S	220/33	DVC	80	SEP-12
60	Giridih (1st Trf.) S/S	220/132	DVC	160	SEP-12
61	Dhanbad	220/132	DVC	300	DEC-12
62	Siliguri S/S (Extn.)	220/132	PGCIL	160	DEC-12
63	Birpara (Aug.) (160-50)	220/132	PGCIL	110	JAN-13
64	Malda (Aug.) (160-50)	220/132	PGCIL	110	JAN-13
65	Malda (2nd Trf.) (Aug.) (160-50)	220/132	PGCIL	110	FEB-13
66	CTPS (Aug.) (160-100)	220/132	DVC	60	MAR-13
67	Dhanbad S/S	220/33	DVC	80	MAR-13
68	Giridih (2nd Trf.) S/S	220/33	DVC	80	MAR-13
69	Parrulia (Aug.) (80-50)	220/33	DVC	30	MAR-13
Total of CENTRAL Sector				1280	
STATE SECTOR					
70	Agathala	220/66	GETCO	100	APR-12
71	Anjar	220/66	GETCO	100	APR-12

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
72	Charanka	220/66	GETCO	200	APR-12
73	Kangasiyali (3rd Trf.)	220/66	GETCO	100	APR-12
74	Lunawada	220/66	GETCO	100	APR-12
75	Shapur	220/132	GETCO	200	APR-12
76	Shiralakha	220/66	GETCO	100	APR-12
77	Tappar	220/66	GETCO	100	APR-12
78	Chhegaon S/S	220/132	MPPTCL	160	APR-12
79	Daloda	220/132	MPPTCL	160	APR-12
80	Seoni (Addl.)	220/132	MPPTCL	160	APR-12
81	Baramati	220/33	MSETCL	25	APR-12
82	Paranda (2nd trf.)	220/33	MSETCL	50	APR-12
83	Wadala Granthian	220/66	PSTCL	100	APR-12
84	Aspur S/S	220/132	RVPNL	100	APR-12
85	Dechu (Jodhpur)	220/132	RVPNL	100	APR-12
86	K.K. Dhani (GIS) S/S	220/132	RVPNL	160	APR-12
87	Padampur	220/132	RVPNL	100	APR-12
88	Barsoor. (Addl)	220/132	CSPTCL	160	MAY-12
89	Girinager (Aug.)	220/132	HPPTCL	100	MAY-12
90	Mehgaon (Addl.)S/S	220/132	MPPTCL	160	MAY-12
91	Tikamgarh (Addl.) (1x160)	220/132	MPPTCL	160	MAY-12
92	Medaram (2x50)	220/11	APTRANSCO	100	JUN-12
93	Vemnur (2x50)	220/11	APTRANSCO	100	JUN-12
94	Palla (Aug.) S/S	220/66	HVPNL	100	JUN-12
95	Balapur S/S	220/33	MSETCL	25	JUN-12
96	Bapgaon (2x50)	220/22	MSETCL	100	JUN-12
97	Jalna S/S	220/33	MSETCL	50	JUN-12
98	Yewalwadi (VSNL Dighi)	220/22	MSETCL	50	JUN-12
99	Balasore (Aug.)	220/132/33	OPTCL	60	JUN-12
100	Paradeep S/S	220/132/33	OPTCL	50	JUN-12

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
101	Kharar (Aug.)	220/66	PSTCL	100	JUN-12
102	Sunam (Aug.)	220/66	PSTCL	60	JUN-12
103	Gunrock	220/132	APTRANSCO	160	JUL-12
104	Thimmapuram	220/11	APTRANSCO	50	JUL-12
105	Electric Lane (GIS)	220/33	DTL	200	JUL-12
106	Kunihar (Aug.)	220/132	HPPTCL	100	JUL-12
107	Daulatabad (Aug.)	220/66	HVPNL	100	JUL-12
108	Isherwal (Aug.)	220/132	HVPNL	100	JUL-12
109	Masudpur	220/33	HVPNL	100	JUL-12
110	Kattakkada (New)	220/110	KSEB	200	JUL-12
111	Punnapra	220/110	KSEB	200	JUL-12
112	South Solapur S/S	220/33	MSETCL	50	JUL-12
113	Ferozepur Road Ludhiana S/S (Addl Trf)	220/66	PSTCL	160	JUL-12
114	Kharagpur (1st Trf.)	220/132	WBSETCL	160	JUL-12
115	A-5 Faridabad	220/66	HVPNL	100	AUG-12
116	Masudpur (2nd trf.)	220/132	HVPNL	100	AUG-12
117	Sagwan S/S (1st Trf.)	220/132	HVPNL	100	AUG-12
118	Sagwan S/S (2nd Trf.)	220/33	HVPNL	100	AUG-12
119	Nimhans S/s	220/66	KPTCL	300	AUG-12
120	Sabalgarh (Addl.) (1x160)	220/132	MPPTCL	160	AUG-12
121	Bapgaon S/S	220/132	MSETCL	400	AUG-12
122	Hiwarwadi S/S	220/22	MSETCL	50	AUG-12
123	Goraya (Addl.)S/S	220/132	PSTCL	100	AUG-12
124	Mohali-II (Addl.) S/S	220/66	PSTCL	100	AUG-12
125	Athipet S/S	230/110	TANTRANSCO	100	AUG-12
126	Kondapuram (1st Trf.)	220/132	APTRANSCO	100	SEP-12
127	Mundka (2nd ICT)	220/66	DTL	160	SEP-12
128	Achhalia (Aug.) S/S	220/132	GETCO	50	SEP-12
129	Bhat (Aug.)	220/66	GETCO	100	SEP-12

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
130	Dahej (Aug.)	220/66	GETCO	100	SEP-12
131	Haldarwa (Aug.)	220/132	GETCO	50	SEP-12
132	Mota (Aug.)	220/66	GETCO	50	SEP-12
133	Timbdi (Aug.)	220/66	GETCO	50	SEP-12
134	Baddi (Addl.) 1x100 MVA	220/66	HPPTCL	100	SEP-12
135	Raiwali S/S	220/66	HVPNL	200	SEP-12
136	Rampur Kamboan S/S (1st Trf.)	220/66	HVPNL	100	SEP-12
137	Rampur Kamboan S/S (2nd Trf.)	220/33	HVPNL	100	SEP-12
138	South Solapur S/S	220/132	MSETCL	200	SEP-12
139	Kotli Surat Malhi (Addl.) S/S	220/66	PSTCL	100	SEP-12
140	Mansa (Addl.) S/S	220/66	PSTCL	100	SEP-12
141	Karambayam	230/110	TANTRANSCO	200	SEP-12
142	Jhusi (2nd Trf.)	220/132	UPPTCL	160	SEP-12
143	Nagari	220/132	APTRANSCO	200	OCT-12
144	Bhilai (Addl.) S/S	220/132	CSPTCL	160	OCT-12
145	Jeur (Trf) S/S	220/132	MSETCL	100	OCT-12
146	Ikolaha (Addl.) S/S	220/66	PSTCL	100	OCT-12
147	Kotla Jangan (Addl) (2nd Trf.)	220/66	PSTCL	100	OCT-12
148	Sadiq (Aug.) (2n T/F) S/S	220/66	PSTCL	100	OCT-12
149	Hathras (Aug.) (160-100) S/S	220/132	UPPTCL	60	OCT-12
150	Laxmikantapur (Aug.)	220/132	WBSETCL	160	OCT-12
151	kharagpur(2nd Trf.)	220/132	WBSETCL	160	OCT-12
152	Halbarga (2x100)	220/110	KPTCL	200	NOV-12
153	Akola (Aug.) S/S	220/132	MSETCL	50	NOV-12
154	Telco S/S	220/22	MSETCL	50	NOV-12
155	Wani (Aug.) S/S	220/33	MSETCL	25	NOV-12
156	Bundi S/S	220/132	RVPNL	100	NOV-12
157	Nadbai S/S	220/132	RVPNL	100	NOV-12
158	Sikrai (Upgradation)	220/132	RVPNL	100	NOV-12

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
159	Dehri (Aug.)	220/132	BSEB	100	DEC-12
160	Rohini (1st Trf.)	220/66	DTL	160	DEC-12
161	Amarkantak (Anoopur) (1x160)	220/132	MPPTCL	160	DEC-12
162	Kakrala S/S	220/66	PSTCL	100	DEC-12
163	Sultanpur Lodhi (Addl.) S/S	220/66	PSTCL	160	DEC-12
164	Udhoke S/S	220/66	PSTCL	100	DEC-12
165	Bommuru (Aug.)	220/132	APTRANSCO	60	JAN-13
166	Brandix (Addl. Trf)	220/132	APTRANSCO	100	JAN-13
167	Ghanapur (Aug)	220/132	APTRANSCO	60	JAN-13
168	Gudivada (Addl. Trf)	220/132	APTRANSCO	100	JAN-13
169	Kondamallepally (Addl. Trf)	220/132	APTRANSCO	100	JAN-13
170	Medchal (Aug)	220/132	APTRANSCO	60	JAN-13
171	Pendurthy (Aug)	220/132	APTRANSCO	60	JAN-13
172	Shadnagar (Addl. Trf)	220/132	APTRANSCO	100	JAN-13
173	Yeddumailaram (Aug)	220/132	APTRANSCO	60	JAN-13
174	Rohini (2nd Trf.)	220/66	DTL	160	JAN-13
175	Amreli S/S	220/66	GETCO	50	JAN-13
176	Gavasad S/S	220/66	GETCO	50	JAN-13
177	Keshod S/S	220/66	GETCO	50	JAN-13
178	Kim S/S	220/66	GETCO	50	JAN-13
179	Lunawada (2nd Trf.)	220/66	GETCO	100	JAN-13
180	Zagadia S/S	220/66	GETCO	50	JAN-13
181	Dadhi Bana S/S (1st Trf.)	220/132	HVPNL	100	JAN-13
182	Dadhi Bana S/S (2nd Trf.)	220/33	HVPNL	100	JAN-13
183	Rangala Rajpur (1st Trf)	220/66	HVPNL	100	JAN-13
184	Bidri S/S	220/33	MSETCL	25	JAN-13
185	Dasgaon S/S	220/33	MSETCL	50	JAN-13
186	Bassi Pathana S/S	220/66	PSTCL	100	JAN-13
187	Doraha (U/G) (1x100 MVA)	220/66	PSTCL	100	JAN-13

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
188	Gaunsgarh S/S	220/66	PSTCL	100	JAN-13
189	Himmatpura (Aug) S/S	220/66	PSTCL	100	JAN-13
190	Lalru (Aug) (2nd T/F)	220/66	PSTCL	100	JAN-13
191	Passiana S/S	220/66	PSTCL	100	JAN-13
192	Sarna (Aug.) S/S	220/66	PSTCL	100	JAN-13
193	Talwandi Bhai	220/66	PSTCL	100	JAN-13
194	Roorkee (Addl.) S/S	220/33	PTCUL	100	JAN-13
195	Gajner	220/132	RVPNL	100	JAN-13
196	Thatchankurichy (Aug.)	230/110	TANTRANSCO	50	JAN-13
197	Allahabad Cantt. (2nd) (Aug.) S/S	220/132	UPPTCL	60	JAN-13
198	Allahabad Cantt. (Aug.) S/S	220/132	UPPTCL	60	JAN-13
199	Atroli (Aug.) S/S	220/132	UPPTCL	60	JAN-13
200	Charla S/S	220/132	UPPTCL	160	JAN-13
201	Chibramau (Aug.) S/S	220/132	UPPTCL	60	JAN-13
202	Hardoi (Aug.) S/S	220/132	UPPTCL	60	JAN-13
203	Noida Sec-62 S/S	220/132	UPPTCL	160	JAN-13
204	Orai (Aug.) S/S	220/132	UPPTCL	60	JAN-13
205	Pratapgarh S/S	220/132	UPPTCL	200	JAN-13
206	R.C. Green (new) S/S	220/132	UPPTCL	160	JAN-13
207	R.C. Green S/S	220/132/33	UPPTCL	100	JAN-13
208	Reva Road Allahabad (Aug.) S/S	220/132	UPPTCL	60	JAN-13
209	Sikandara (Aug.) S/S	220/132	UPPTCL	60	JAN-13
210	Sohawal S/S	220/33	UPPTCL	100	JAN-13
211	Alephata (Addl) S/S	220/33	MSETCL	50	FEB-13
212	Anandnagar (Addl) S/S	220/22	MSETCL	50	FEB-13
213	Badnera (Add.)	220/132	MSETCL	50	FEB-13
214	Bhosari (New)	220/22	MSETCL	50	FEB-13
215	Matradevi (Addl.)	220/132	MSETCL	50	FEB-13
216	Nerul (Addl) S/S	220/33	MSETCL	50	FEB-13

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
217	Palsi (New) S/S	220/33	MSETCL	100	FEB-13
218	Butari (Addl.) S/S	220/33	PSTCL	100	FEB-13
219	Lalton Kalan (Addl.) S/S	220/33	PSTCL	160	FEB-13
220	Banda (Aug.)	220/132	UPPTCL	60	FEB-13
221	Muzaffarnagar (Aug.)	220/132	UPPTCL	60	FEB-13
222	Muzaffarpur TPS (Kanti) (Aug.)	220/132	BSEB	100	MAR-13
223	Sipara (Patna) (2x150)	220/132	BSEB	300	MAR-13
224	Bhachau S/S	220/66	GETCO	100	MAR-13
225	Kapadwanj S/S	220/66	GETCO	50	MAR-13
226	Limbdi (Addl.) S/S	220/66	GETCO	50	MAR-13
227	Shapur (3rd Trf.)	220/66	GETCO	100	MAR-13
228	Kaul S/S (2nd Trf.)	220/132	HVPNL	100	MAR-13
229	Nawada (1x100)	220/33	HVPNL	100	MAR-13
230	Nawada (2x100)	220/66	HVPNL	415	MAR-13
231	Rangala Rajpur (2nd Trf)	220/33	HVPNL	100	MAR-13
232	Delina (Aug.)	220/132	JKPDD	160	MAR-13
233	Neelagunda S/S	220/66	KPTCL	200	MAR-13
234	Bhosari S/S	220/22	MSETCL	0	MAR-13
235	Ghatodi S/S	220/132/33	MSETCL	0	MAR-13
236	Khadakwasla S/S	220/22	MSETCL	0	MAR-13
237	Sakri S/S	220/132/33	MSETCL	0	MAR-13
238	butibori III	220/132	MSETCL	0	MAR-13
239	Hamigarh (1x100)	220/132	RVPNL	100	MAR-13
240	Karwad / Bhawad S/S	220/132	RVPNL	100	MAR-13
241	Kasba (Aug.)	220/132	WBSETCL	160	MAR-13
Total of STATE Sector				18055	
Toatl of 220 kV				19335	
132 kV					
STATE SECTOR					

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
242	Surajmaninagar S/S (Upgrdable to 400 kV)	132/33	TSECL	0	DEC-12
Total of STATE Sector				0	
Toatl of 132 kV				0	

Annex-6.2 (A)

Transmission Lines Completed During - 2013-2014

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
765 kV					
CENTRAL SECTOR					
1	Agra - Jhatikara	S/C	PGCIL	252	APR-13
2	Sasan - Satna line -II	S/C	PGCIL	242	APR-13
3	Meerut - Agra	S/C	PGCIL	268	MAY-13
4	Sasaram - Fatehpur line-II	S/C	PGCIL	355	MAY-13
5	Fatehpur- Agra line-II	S/C	PGCIL	334	SEP-13
6	Raigarh Pooling Station (Near Kotra) - Raigarh Pooling Station (Near Tammar) line	D/C	PGCIL	98	OCT-13
7	Jabalpur Pooling Station - Bina line	D/C	PGCIL	459	DEC-13
8	Raichur - Sholapur	S/C	PGCIL	208	DEC-13
9	Meerut - Bhiwani line	S/C	PGCIL	174	JAN-14
10	Raigarh Pooling Station (Near Kotra) - Raipur Pooling Station line	D/C	PGCIL	480	JAN-14
11	Satna - Gwalior line (Ckt-I)	S/C	PGCIL	337	FEB-14
12	LILO of Ranchi - WR Pooling Station at Dharamjaygarh / near Korba.	D/C	PGCIL	10	MAR-14
13	Lucknow - Bareilly line	S/C	PGCIL	252	MAR-14
14	Ranchi - WR Pooling Station	S/C	PGCIL	381	MAR-14
Total of CENTRAL Sector				**3850**	
PVT SECTOR					
15	Tiroda - Akola-II	S/C	APL	361	FEB-14
Total of PVT Sector				**361**	
STATE SECTOR					
16	Anta - Phagi (Jaipur South Ckt-2)(Charged at 400 kV)	S/C	RVPNL	214	JAN-14
17	Anta - Phagi (Jaipur South Ckt-1)	S/C	RVPNL	212	MAR-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
Total of STATE Sector				**426**	
Total of 765 kV				**4637**	
400 kV					
CENTRAL SECTOR					
18	Raigarh Pooling Station (Near Kotra) - Raigarh line	D/C	PGCIL	13	APR-13
19	Jamshedpur - Baripada (Balance Portion)	D/C	PGCIL	62	MAY-13
20	LILO of Rourkela - Raigarh at Jharsuguda Pooling Stn. Ckt-II	D/C	PGCIL	44	MAY-13
21	Indore - Indore Ckt-II	D/C	PGCIL	50	JUN-13
22	Durgapur STPS - Raghunathpur	D/C	DVC	138	JUL-13
23	LILO of Parbati -II - Koldam at Parbati Pooling Point.	D/C	PGCIL	1	JUL-13
24	LILO of Parbati -II - Parbati Pooling Point at Parbati -III	D/C	PGCIL	4	JUL-13
25	Parbati Pooling Point - Amritsar	D/C	PGCIL	501	JUL-13
26	Baharampur (India)-Bheramerar (Bangladesh) line - India Portion	D/C	PGCIL	143	AUG-13
27	LILO of Farakka - Jeerat line at Baharampur (India)	S/C	PGCIL	5	AUG-13
28	Thermal Powertech - Nellore Pooling Station	D/C	PGCIL	65	AUG-13
29	LILO of Both Ckt of Kishenpur - Wagoora line at Wanpoo	D/C	PGCIL	9	SEP-13
30	Agra - Sikar line	D/C	PGCIL	775	DEC-13
31	Bassi (PG)- Jaipur (RVPN) 765 KV line (Q)	D/C	PGCIL	97	DEC-13
32	Jabalpur Pooling Station - Jabalpur (High Capacity) line	D/C	PGCIL	31	DEC-13
33	LILO of Raichur (exisiting)- Gooty at Raichur (New)	D/C	PGCIL	21	DEC-13
34	LILO of One Ckt of Parbati Pooling Stn. - Amritsar line at Hamirpur	D/C	PGCIL	7	DEC-13
35	LILO of Bangalore - Salam at Hosur	D/C	PGCIL	25	JAN-14
36	Ranchi (New) -Ranchi line -I	D/C	PGCIL	162	JAN-14
37	Shifting of Ankola -Aurangabad (MSETCL) to Aurangabad (PG)	D/C	PGCIL	102	JAN-14
38	LILO of Nathpa Jhakri - Nalagarh at Rampur (Loop in portion)	D/C	PGCIL	5	FEB-14
39	Bareilly (New) - Bareilly (Exist) line (Quad)	D/C	PGCIL	2	MAR-14
40	Kurnool (new) - Kurnool line	D/C	PGCIL	20	MAR-14
41	LILO of Bhiwadi - Bassi at Kotputli	D/C	PGCIL	17	MAR-14
42	LILO of Kahalgaon - Biharshariff line (Ist line) at Lakhisarai	D/C	PGCIL	56	MAR-14
43	LILO of Kolar - Sriperumbdure at Thiruvalam	D/C	PGCIL	42	MAR-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
44	LILO of Nagarjunsagar - Gooty at Kurnool	D/C	PGCIL	70	MAR-14
45	LILO of One Ckt of Talchar - Meramundali at Angul Pooling Station	D/C	PGCIL	34	MAR-14
46	LILO of Vapi - Navi Mumbai at Kala	D/C	PGCIL	18	MAR-14
47	Ranchi (New) -Ranchi line -II	D/C	PGCIL	158	MAR-14
48	Tiruvelam (PG) - Chitoor	D/C	PGCIL	42	MAR-14
49	Vadodara - Pirana (Quad)	D/C	PGCIL	274	MAR-14
50	Vadodra - Asoj line	D/C	PGCIL	24	MAR-14
51	Vapi - Kala (Part of Vapi-Navimumbai)	D/C	PGCIL	61	MAR-14
Total of CENTRAL Sector				**3078**	
PVT SECTOR					
52	Dhariwal TPS -Channdrapur II (1st Ckt)	S/C	DIPL	10	SEP-13
53	Prunia - Biharsharif Line (ENICL)	D/C	SGL	464	SEP-13
54	Parli (PG) - Pune (PG)	MC+D/C	RPTL	668	NOV-13
55	Pune (PG) - Aurangabad (MSETCL)	MC+D/C	RPTL	476	JAN-14
56	Akola- I - Akola-II	D/C	APL	61	FEB-14
57	Nasik-Bableshwar (1st Ckt)	D/C	IBPL	57	MAR-14
58	LILO of Rourkela - Raigarh at Sterlite TPP (2nd LILO)	D/C	SEL	60	MAR-14
Total of PVT Sector				**1796**	
STATE SECTOR					
59	LILO of Chandrapur - Parli at Chandrapur II	D/C	MSETCL	3	APR-13
60	Rajpura - Dhuri	D/C	PSTCL	171	MAY-13
61	Rajpura Thermal - Rajpura	D/C	PSTCL	18	MAY-13
62	Marwa - Raipur (Raitha)	D/C	CSPTCL	281	JUN-13
63	Daultabad - Gurgaon (PGCIL) Sector - 72	D/C	HVPNL	42	JUN-13
64	Chandrapur-II - Warora	D/C	MSETCL	91	JUN-13
65	Makhu (PGCIL) - Amritsar line	D/C	PSTCL	128	AUG-13
66	Bhoopalapally (Kakatiya) - Gajwel	D/C	APTRANSCO	262	SEP-13
67	LILO of Karadi I - India Bulls at Koradi II	D/C	MSETCL	7	SEP-13
68	Malwa TPP - Pithampur	D/C	MPPTCL	272	NOV-13
69	Parichha - Mainpuri (1st Ckt.)	D/C	UPPTCL	259	DEC-13
70	Raigarh - Saraipalli	D/C	CSPTCL	222	JAN-14
71	Vadinar - Amreli (Part line)	D/C	GETCO	117	JAN-14
72	Kawai - Anta (Baran)	D/C	RVPNL	101	JAN-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
73	Alamathy -Sunguvarchatram (1st Ckt)	D/C	TANTRANSCO	98	JAN-14
74	Paricha - Mainpuri 2nd Ckt.)	D/C	UPPTCL	259	JAN-14
75	Khedamara - Raipur	D/C	CSPTCL	90	FEB-14
76	Kolaghat TPS - Kharagpur	S/C	WBSETCL	91	FEB-14
77	Pithampur-Indore	D/C	MPPTCL	128	MAR-14
78	Chandrapur switching Stn. - Chandrapur II S/S	S/C	MSETCL	4	MAR-14
79	Kalisndh TPS - Anta (Baran) Pooling Station (Quad)	D/C	RVPNL	159	MAR-14
80	Alamathy -Sunguvarchatram (2nd Ckt)	D/C	TANTRANSCO	100	MAR-14
Total of STATE Sector				**2903**	
Total of 400 kV				**7777**	
220 kV					
CENTRAL SECTOR					
81	LILO of Ckt-I Jullandhur - Hamirpur at Hamirpur (PG)	D/C	PGCIL	15	DEC-13
Total of CENTRAL Sector				**15**	
PVT SECTOR					
82	Subhasgram (PGCIL) - CESC 220 KV S/S	D/C	CESC	48	MAR-14
Total of PVT Sector				**48**	
STATE SECTOR					
83	Jalna -Chikhali line (Ckt I)	S/C	MSETCL	90	APR-13
84	Ramnathpuram-Thondamanatham-I	S/C on D/C	PED	4	APR-13
85	Ramnathpuram-Thondamanatham-II	S/C on D/C	PED	3	APR-13
86	Thudiyalur-O.K. Mandapam (2nd Ckt Strng.)	S/C	TANTRANSCO	26	APR-13
87	LILO of one Ckt of STPS - N. Bishnupur line at Hura	D/C	WBSETCL	32	APR-13
88	Bemetara - Mungeli	S/C	CSPTCL	40	MAY-13
89	Deepalpur-Barhi	D/C	HVPNL	25	MAY-13
90	Chogawan Mazra - Nabha (2nd Ckt)	S/C	PSTCL	33	MAY-13
91	LILO of Khasa - Civil line at Amritsar	D/C	PSTCL	12	MAY-13
92	LILO of Savarkundla - Vartej at BECL (Padva)	D/C	GETCO	56	JUN-13
93	Nakhatrana-Varsana line	D/C	GETCO	214	JUN-13
94	Otha (Mahuva) - Sagapara (Palitana)	D/C	GETCO	96	JUN-13
95	Ahmadnagar - Bhose (Belwandi)	D/C	MSETCL	94	JUN-13
96	Dhule Chalisgaon Dondaicha - Kundane Dhule (Extn. of line)	S/C	MSETCL	1	JUN-13

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
97	Dhule Dondaicha - Kundane Dhule (Extn. of line)	S/C	MSETCL	1	JUN-13
98	Kharghar - Kalwa	M/C	MSETCL	89	JUN-13
99	LILO of Deepnagar - Amalner at Bhamburi	D/C	MSETCL	16	JUN-13
100	Mhaisal - Jath line	D/C	MSETCL	134	JUN-13
101	Parli - Parli (interconnection)	S/C	MSETCL	1	JUN-13
102	Phaltan MIDC - Bothe - Lonad Bothe	S/C	MSETCL	32	JUN-13
103	Urse - Talegaon line 2ckt	S/C	MSETCL	9	JUN-13
104	LILO of Gobi- MTPS at Anthiyur	D/C	TANTRANSCO	2	JUN-13
105	Khedamara - Rajnandgaon(2nd Ckt)	S/C	CSPTCL	50	JUL-13
106	LILO of GCR - Gadchandur at M/s Grace Industries	D/C	MSETCL	2	JUL-13
107	LILO of Patiala - Patran at Passiana.	D/C	PSTCL	2	JUL-13
108	LILO of one ckt Patran - Sunam at Bangan	D/C	PSTCL	24	JUL-13
109	Arasur - Palladam	S/C on D/C	TANTRANSCO	55	JUL-13
110	Purnea (PG)-Madhepura Line	D/C	BSEB	200	AUG-13
111	LILO of one ckt Patran - Rajla at Kakrala	D/C	PSTCL	6	AUG-13
112	LILO of one ckt Rajpura - Mohali-I line at Banur	D/C	PSTCL	29	AUG-13
113	LILO of one ckt of GHTP-Mansa line at Talwandi Sabo	D/C	PSTCL	59	AUG-13
114	LILO of Heerapura - Khetri line (Second Ckt.) to LILO of one Ckt. of Neemrana - Kotputli line	D/C	RVPNL	124	AUG-13
115	LILO of Barsinghar (LTPS) - Phalodi at Baap	D/C	RVPNL	51	AUG-13
116	LILO of Chittorgarh - Debari at Chittorgarh	D/C	RVPNL	3	AUG-13
117	LILO of one ckt Sarusajai -Samaguri at Jawaharnagar S/S	D/C	AEGCL	1	SEP-13
118	Raipur- Urla - Siltara line	D/C	CSPTCL	26	SEP-13
119	Baddi - Nalagarh	D/C	HPPTCL	24	SEP-13
120	Kabalpur - Badhan	D/C	HVPNL	46	SEP-13
121	LILO of Narwana - Safidon at Mundh	D/C	HVPNL	8	SEP-13
122	Zainkote-Amargarh	D/C	JKPDD	85	SEP-13
123	Lohardagga-Latehar	D/C	JSEB	112	SEP-13
124	LILO of both ckts of Nimrani-Julwania at Julwania	D/C	MPPTCL	6	SEP-13
125	Sadawaghapur - Karad line - sadawaghapur	S/C	MSETCL	30	SEP-13
126	Talegaon (MSETCL) - Talegaon (PG)	D/C	MSETCL	3	SEP-13
127	Vita - Ghatnande line - Wayphale	S/C	MSETCL	25	SEP-13

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
128	LILO of one ckt of GGSSTP - Gobindgarh line at Bassi Pathana	D/C	PSTCL	12	SEP-13
129	Heerapur - Mansarovar (GIS)	S/C	RVPNL	2	SEP-13
130	LILO of Kankroli -Bali at Baman ka tukda	D/C	RVPNL	4	SEP-13
131	Sanganer-Mansarovar (Upgradation)	D/C	RVPNL	2	SEP-13
132	Extension of NCTPS - Gummudipoondi feeder to M/s Michellin Tyres.	S/C	TANTRANSCO	18	SEP-13
133	Oglapur 400kV S/S- Durshed	D/C	APTRANSCO	142	OCT-13
134	Bidadi 400kV(PG) -Bidadi 220kV S/S	D/C	KPTCL	7	OCT-13
135	Ghataprabha - Chikkodi	D/C	KPTCL	75	OCT-13
136	400 kV GSS PGCIL, Jaipur South (Chaksu) - Chaksu GSS	D/C	RVPNL	16	OCT-13
137	LILO of Khetri - Reengus at 400 kV GSS Babai	D/C	RVPNL	2	OCT-13
138	Elephantgate - Mylapore (UG cable)	S/C	TANTRANSCO	12	OCT-13
139	LILO of Tharamani - Veerapuram at 400 kV Kalivanthapattu	S/C	TANTRANSCO	16	OCT-13
140	Sambhal - Gajraula	S/C	UPPTCL	43	OCT-13
141	Xeldem-Cuncolim	D/C	ED- GOA	20	NOV-13
142	LLIO of Bahadurgarh- Rohtak at Kabulpur	D/C	HVPNL	47	NOV-13
143	LILO of Itarsi - Narsinghpur at Chichali	D/C	MPPTCL	4	NOV-13
144	LILO of Nagdha - Neemuch at Daloda	D/C	MPPTCL	9	NOV-13
145	LILO of Dausa -Anta at Lalsot	D/C	RVPNL	21	NOV-13
146	LILO of K.R. Thoppur - Gobi at Pallakkapalayam	D/C	TANTRANSCO	10	NOV-13
147	LILO of Khara - Saharanpur at Behat	D/C	UPPTCL	5	NOV-13
148	Paricha-Jhansi	D/C	UPPTCL	28	NOV-13
149	Dalkhola(PG)- Dalkhola	D/C	WBSETCL	2	NOV-13
150	Jeerat-Rishra	D/C	WBSETCL	140	NOV-13
151	LILO of Veltoor -Jurala at Lower Jurala HEP	D/C	APTRANSCO	9	DEC-13
152	Bahadurgarh - Devigarh	D/C	PSTCL	56	DEC-13
153	Hindaun - Gangapurcity	D/C	RVPNL	107	DEC-13
154	Kharagpur - Midnapur	D/C	WBSETCL	92	DEC-13
155	LILO of Manubolu - Renigunta at Ranchagunneri S/S	D/C	APTRANSCO	2	JAN-14
156	LILO of Tadikanda - Ongole at Podili (Lot I & II)	D/C	APTRANSCO	143	JAN-14
157	LILO of 2nd Ckt of GHTP - Mansa at Dhanaula	D/C	PSTCL	78	JAN-14
158	LILO of GGSSTP - Sahnewal at Ghulal	D/C	PSTCL	11	JAN-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
159	LILO of one ckt of Jamsher - Sultanpur at Badshahpur	D/C	PSTCL	14	JAN-14
160	Churk - Robertsganj	D/C	UPPTCL	13	JAN-14
161	Latehar- Daltonganj	D/C	JSEB	130	FEB-14
162	Kotputli - Manoharpur	D/C	RVPNL	99	FEB-14
163	LILO of Gachibowli - Thandur at Yeddumailaram	D/C	APTRANSCO	20	MAR-14
164	Sattenapalli (Narsaraopet) - Narsaraopet	D/C	APTRANSCO	40	MAR-14
165	Yeddumailaram - Sadasivpet	D/C	APTRANSCO	74	MAR-14
166	Extn. of Hajipur - Muzaffarpur (Kanti) to Muzaffarpur (PG)	D/C	BSEB	14	MAR-14
167	LILO of Korba- Amarkantak I & II at Churri	D/C	CSPTCL	2	MAR-14
168	Ridge Valley - Trauma Centre/ AIIMS	D/C	DTL	12	MAR-14
169	BECL (Padva)- Sagapara line	D/C	GETCO	82	MAR-14
170	LILO of Chorania-Gondal at Sadla	D/C	GETCO	58	MAR-14
171	LILO of Halvad - Bhimasar at Halvad	D/C	GETCO	19	MAR-14
172	LILO of Navsari - Vav line at Popada	D/C	GETCO	18	MAR-14
173	LILO of Tappar - Shivlakha at PS 3 (Bhachau)	D/C	GETCO	3	MAR-14
174	LILO of both ckts of Hadala - Halvad at Sartanpar	D/C	GETCO	46	MAR-14
175	LILO of one ckt Wanakbori-Asoj line at Jarod	D/C	GETCO	28	MAR-14
176	Diversion of Sarni - Pandhurna	D/C	MPPTCL	4	MAR-14
177	Modification / Shifting of Sukha - Birsinghpur / Amarkantak	D/C	MPPTCL	13	MAR-14
178	Modification/Shifting of Jabalpur - Amarkantak	D/C	MPPTCL	16	MAR-14
179	Ratlam - Daloda line	D/C	MPPTCL	74	MAR-14
180	Diversion of Koradi - Kalwa Ckt-I (Bhusawal - Aurangabad) at Jalgaon	S/C	MSETCL	2	MAR-14
181	Diversion of Koradi - Kalwa Ckt-I (Bhusawal - BBLR) at Jalgaon	S/C	MSETCL	2	MAR-14
182	LILO of 2nd Ckt Vita -Pandhrapur line at Hiwarwadi S/S	D/C	MSETCL	6	MAR-14
183	LILO of Khaparkheda - Wardha at New Buttibori-III	D/C	MSETCL	3	MAR-14
184	LILO of Pusad - Nanded at Ghatodi	D/C	MSETCL	33	MAR-14
185	LILO of Waluj Bahaleshwar at Deogaon Rangari S/S	D/C	MSETCL	26	MAR-14
186	Tap on Babhaleshwar - Chalisgaon at Kopergaon	D/C	MSETCL	11	MAR-14
187	Tap on Vita - Comboti at Mahali S/S	D/C	MSETCL	2	MAR-14
188	Dhuri-Bangan	D/C	PSTCL	101	MAR-14
189	BAAP - Bhadla	D/C	RVPNL	104	MAR-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
190	LILO of Ratangarh - Reengus at Laxmangarh	D/C	RVPNL	6	MAR-14
191	LILO of Kundha PH III - PUSHEP at Karamadai	D/C	TANTRANSCO	2	MAR-14
192	LILO of Bharthana - Manipuri at Saifai	D/C	UPPTCL	2	MAR-14
193	LILO of Domjur - Howrah at Foundry Park	D/C	WBSETCL	60	MAR-14
194	LILO of Jeerat - KLC at NTAA-III	D/C	WBSETCL	4	MAR-14
Total of STATE Sector				**4259**	
Total of 220 kV				**4322**	

Annex-6.2 (B)

Sub-stations Completed During - 2013-2014

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
765 kV					
CENTRAL SECTOR					
1	Meerut S/S	765/400	PGCIL	3000	MAY-13
2	Sasaram (1st Trf.) S/S	765/400	PGCIL	1500	MAY-13
3	Indore (1st Trf.)	765/400	PGCIL	1500	JUN-13
4	Indore (2nd Trf.)	765/400	PGCIL	1500	SEP-13
5	Raigarh Pooling Station (Kotra)	765/400	PGCIL	4500	OCT-13
6	Raigarh Pooling Station (Near Tamnar) 1st ICT	765/400	PGCIL	1500	OCT-13
7	Raigarh Pooling Station (Near Tamnar) 2nd ICT	765/400	PGCIL	1500	NOV-13
8	Jabalpur Pooling Station (Ist ICT)	765/400	PGCIL	1500	DEC-13
9	Raichur S/S (1st ICT)	765/400	PGCIL	1500	DEC-13
10	Raichur S/S (2nd ICT)	765/400	PGCIL	1500	JAN-14
11	Raipur Pooling Station	765/400	PGCIL	1500	JAN-14
12	Solapur S/S	765/400	PGCIL	3000	JAN-14
13	Raigarh Pooling Station (Near Tamnar) 3rd ICT	765/400	PGCIL	1500	FEB-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
14	Raigarh(Kotra) Pooling Stn. (4th ICT)	765/400	PGCIL	1500	FEB-14
15	Jabalpur Pooling Station (2nd ICT)	765/400	PGCIL	1500	MAR-14
16	Ranchi	765/400	PGCIL	3000	MAR-14
Total of CENTRAL Sector				31500	
PVT SECTOR					
17	Akola -II S/S	765/400	APL	1500	FEB-14
18	Tiroda S/S	765/400	APL	1500	FEB-14
Total of PVT Sector				3000	
STATE SECTOR					
19	Unnao (Phase -II) (2nd Trf.)	765/400	UPPTCL	1000	NOV-13
Total of STATE Sector				1000	
Toatl of 765 kV				35500	
400 kV					
CENTRAL SECTOR					
20	Amritsar S/S	400/220	PGCIL	500	SEP-13
21	Wanpoo (1st Trf.)	400/220	PGCIL	315	SEP-13
22	Abdullapur S/S	400/220	PGCIL	315	OCT-13
23	Mapusa S/S	400/220	PGCIL	315	OCT-13
24	Nalagarh S/S	400/220	PGCIL	315	OCT-13
25	Hamirpur GIS (1st ICT)	400/220	PGCIL	315	DEC-13
26	Aurangabad S/S	400/220	PGCIL	630	JAN-14
27	Hosur (Aug.) S/S	400/220	PGCIL	315	FEB-14
28	Kishenpur (Add. Trf) S/S	400/220	PGCIL	315	FEB-14
29	Moga (Aug.) ICT-II	400/220	PGCIL	500	FEB-14
30	Hamirpur GIS (2nd ICT)	400/220	PGCIL	315	MAR-14
31	Kala S/S	400/220	PGCIL	630	MAR-14
32	Kotputli	400/220	PGCIL	630	MAR-14
33	Lakhisarai (1st Trf.)	400/132	PGCIL	200	MAR-14
34	Ludhiana (Extn.) S/S	400/220	PGCIL	500	MAR-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
Total of CENTRAL Sector				6110	
STATE SECTOR					
35	Pithampur S/S	400/220	MPPTCL	630	APR-13
36	Killing (Byrnihat) (2nd Trf.)S/S	400/220	MeECL	315	MAY-13
37	Ashta New S/S	400/220	MPPTCL	315	SEP-13
38	Nawada (2nd Trf.)	400/220	HVPNL	315	NOV-13
39	Agra (Aug.)	400	UPPTCL	185	NOV-13
40	Halvad	400/220	GETCO	315	JAN-14
41	Kosamba	400/220	GETCO	315	JAN-14
42	Makhu (2x315)	400/220	PSTCL	630	MAR-14
Total of STATE Sector				3020	
Toatl of 400 kV				9130	
220 kV					
STATE SECTOR					
43	Bhose (Belwandi) S/S	220/132	MSETCL	200	APR-13
44	Thondamanatham (2x100)	230/110	PED	200	APR-13
45	Renganathapuram (Aug) (100-50)	220/132	TANTRANSCO	50	APR-13
46	Kathapur S/S	220/132	MSETCL	100	MAY-13
47	Aliyar S/S	230/110	TANTRANSCO	100	MAY-13
48	Manali (Addl.) S/S	230/110	TANTRANSCO	100	MAY-13
49	Begusarai (Aug.)	220/132	BSEB	100	JUN-13
50	Fatuha (Aug.)	220/132	BSEB	100	JUN-13
51	Bhatiya. (2nd Trf.)	220/132	GETCO	100	JUN-13
52	Mehal Kalan (Add. Trf.)	220/66	PSTCL	100	JUN-13
53	Thudiyalur (Aug.) (100-80)	230/110	TANTRANSCO	20	JUN-13
54	Behat S/S	220/132	UPPTCL	320	JUN-13
55	Kursi Road (1st Trf.)	220/132	UPPTCL	100	JUN-13
56	Baramati (Addl.) S/S	220/132	MSETCL	100	JUL-13
57	Bangan S/S	220/66	PSTCL	160	JUL-13

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
58	Koyembedu (CMRL) GIS S/S	230/110	TANTRANSCO	200	JUL-13
59	Hajipur (2x100)	220/132	BSEB	200	AUG-13
60	Madhepura (2x100)	220/132	BSEB	200	AUG-13
61	Focal Point Nabha (Addl.) S/S	220/66	PSTCL	160	AUG-13
62	Baap (Upgradation)	220/132	RVPNL	160	AUG-13
63	Mansarovar (Upgradation)	220/132	RVPNL	160	AUG-13
64	Kayathar (Addl.) S/S	220/110	TANTRANSCO	100	AUG-13
65	Jawaharnagar (2x50) (GIS)	220/33	AEGCL	100	SEP-13
66	Bothe (Addl.)	220/33	MSETCL	100	SEP-13
67	Kathapur (Addl.)	220/132	MSETCL	100	SEP-13
68	Wayphale S/S	220/33	MSETCL	50	SEP-13
69	Banur S/S	220/66	PSTCL	100	SEP-13
70	Chhaiali S/S	220/66	PSTCL	100	SEP-13
71	Chogawan (Aug.) (2nd T/F) S/S	220/66	PSTCL	100	SEP-13
72	Ghulal S/S	220/66	PSTCL	100	SEP-13
73	Jhunir (Addl.) S/S	220/66	PSTCL	160	SEP-13
74	Mansarvor (2nd Trf) S/S	220/66	RVPNL	160	SEP-13
75	Theni (Add.Trf.)	230/110	TANTRANSCO	100	SEP-13
76	Kursi Road (2nd Trf.)	220/132	UPPTCL	100	SEP-13
77	Doraha (Add Tr.)	220/66	PSTCL	100	OCT-13
78	Chaksu (UPG) S/S	220/132	RVPNL	160	OCT-13
79	Thiruvarur (Aug) (100-80)	220/110	TANTRANSCO	20	OCT-13
80	Saraipali	220/132	CSPTCL	160	NOV-13
81	Cuncolim	220/33	ED- GOA	150	NOV-13
82	Badhana S/S	220/132	HVPNL	200	NOV-13
83	Mundh S/S	220/33	HVPNL	100	NOV-13
84	Samain S/S (1st Trf.)	220/132	HVPNL	100	NOV-13
85	Samain S/S (2nd Trf.)	220/33	HVPNL	100	NOV-13

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
86	Jabalpur (Addl.)	220/132	MPPTCL	160	NOV-13
87	Lonikhand II (Addl.) S/S	220/22	MSETCL	50	NOV-13
88	Bidanasi S/S	220/132	OPTCL	160	NOV-13
89	Laxmipur S/S	220/132	OPTCL	20	NOV-13
90	Kids Park (Aug.)	220/110	TANTRANSCO	20	NOV-13
91	Etah (Aug.)	220/132	UPPTCL	60	NOV-13
92	Fatehpur (Aug.)	220/132	UPPTCL	60	NOV-13
93	Ghazipur (Aug.)	220/132	UPPTCL	60	NOV-13
94	Gomtinagar S/S	220/132	UPPTCL	60	NOV-13
95	Mainpuri (Aug.)	220/132	UPPTCL	60	NOV-13
96	Panki (Aug.)	220/132	UPPTCL	60	NOV-13
97	Badot (Addl.)	220/132	MPPTCL	160	DEC-13
98	Chichali	220/132	MPPTCL	160	DEC-13
99	Ghulal S/S (2nd Trf)	220/66	PSTCL	100	DEC-13
100	Talwandi Bhai (Addl.)	220/132	PSTCL	100	DEC-13
101	Nellore (Aug) (160-100)	220/132	APTRANSCO	60	JAN-14
102	Rachagunneri	220/132	APTRANSCO	100	JAN-14
103	Bhachau (2nd Trf.) S/S	220/66	GETCO	100	JAN-14
104	Bhatiya. (3rd Trf.)	220/132	GETCO	100	JAN-14
105	Halvad (1x100)	220/66	GETCO	100	JAN-14
106	Kosamba	220/66	GETCO	200	JAN-14
107	Mokha S/S	220/66	GETCO	100	JAN-14
108	Sadla	220/66	GETCO	200	JAN-14
109	Badshahpur (2nd T/F) S/S	220/66	PSTCL	100	JAN-14
110	Devigarh S/S	220/66	PSTCL	100	JAN-14
111	Dhanaula S/S	220/66	PSTCL	160	JAN-14
112	Humbran (Addl.)	220/66	PSTCL	100	JAN-14
113	Pakhowal (Addl.)	220/66	PSTCL	100	JAN-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
114	Lalsot (Upgradation)	220/132	RVPNL	100	JAN-14
115	Nallamanaickenpaty (New)	230/110	TANTRANSCO	80	JAN-14
116	Robertsganj S/S	220/132	UPPTCL	160	JAN-14
117	Howrah (Aug.)	220/132	WBSETCL	160	JAN-14
118	EPIP GIS S/S	220/66	KPTCL	300	FEB-14
119	Gangapurcity	220/132	RVPNL	100	FEB-14
120	Monoharpur (UPG)	220/132	RVPNL	100	FEB-14
121	Muthaiyapuram (Add. Trf)	230/110	TANTRANSCO	100	FEB-14
122	Mylapore (GIS) New	230/110	TANTRANSCO	100	FEB-14
123	Thiruvarur (2nd Trf.) Aug. (100-80)	230/110	TANTRANSCO	20	FEB-14
124	Sadasivpet	220/132	APTRANSCO	100	MAR-14
125	Dehri (Aug.)	220/132	BSEB	100	MAR-14
126	Asoj (Aug.)	220/66	GETCO	100	MAR-14
127	Godhra (Aug.)	220/66	GETCO	50	MAR-14
128	Jarod	220/66	GETCO	100	MAR-14
129	Karamsad (Aug.)	220/66	GETCO	100	MAR-14
130	Karjan S/S	220/66	GETCO	100	MAR-14
131	PS 3 (Bhachau) S/S	220/11	GETCO	50	MAR-14
132	Popda	220/66	GETCO	100	MAR-14
133	Sartanpar S/S	220/66	GETCO	160	MAR-14
134	Sagar (Addl.)	220/132	MPPTCL	160	MAR-14
135	Ujjain S/S	220/132	MPPTCL	160	MAR-14
136	Vidisha (Addl.)	220/132	MPPTCL	160	MAR-14
137	Deogaon Rangari (1x100)	220/132	MSETCL	100	MAR-14
138	Deogaon Rangari (1x50)	220/33	MSETCL	50	MAR-14
139	Ghatodi S/S (Addl.)	220/132	MSETCL	100	MAR-14
140	Ghatodi S/S (Addl.)	220/33	MSETCL	50	MAR-14
141	Kopergaon (2x200) S/S	220/132	MSETCL	400	MAR-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
142	Kopergaon (2x50) S/S	220/33	MSETCL	100	MAR-14
143	Nanded S/S	220/22	MSETCL	50	MAR-14
144	New Butibori-III S/S	220/33	MSETCL	50	MAR-14
145	Pimpalgaon (Ranwad) (2x100)	220/132	MSETCL	100	MAR-14
146	Shivajinager (Sakri) S/S	220/132	MSETCL	100	MAR-14
147	Lapanga S/S	220/132	OPTCL	160	MAR-14
148	Chhajali (Addl.)	220/66	PSTCL	100	MAR-14
149	Gaunsgarh S/S (Addl)	220/66	PSTCL	160	MAR-14
150	Jagraon(Aug.)	220/66	PSTCL	60	MAR-14
151	Malerkotla(Aug.)	220/66	PSTCL	60	MAR-14
152	Nurmehal (T/F) S/S	220/66	PSTCL	100	MAR-14
153	Talwandi Sabo (New)	220/66	PSTCL	100	MAR-14
154	Laxmangarh S/S	220/132	RVPNL	100	MAR-14
155	Mylapore (GIS) (Addl)	230/33	TANTRANSCO	100	MAR-14
156	Safai (New) S/S	220/132	UPPTCL	320	MAR-14
157	Foundary Park	220/132	WBSETCL	320	MAR-14
158	Hura S/S	220/132	WBSETCL	160	MAR-14
Total of STATE Sector				13700	
Toatl of 220 kV				13700	

Annex-6.3 (A)

Transmission Lines Completed During - 2014-2015

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
765 kV					
CENTRAL SECTOR					
1	Bina - Gwalior line (3rd Ckt)	S/C	PGCIL	231	MAY-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
2	Champa Pooling Station - Dharamjaygarh / Near Korba Switching Station line	S/C	PGCIL	62	MAY-14
3	Champa Pooling Station - Raipur Pooling Station line	D/C	PGCIL	298	MAY-14
4	Indore - Vadodara	S/C	PGCIL	320	MAY-14
5	Kurnool - Raichur (IInd Ckt)	S/C	PGCIL	118	JUN-14
6	Rihand - Vindhyachal Pooling Station (1st Ckt)	S/C	PGCIL	31	JUN-14
7	Jharsuguda Pooling Station Dharamjaygarh line.	D/C	PGCIL	300	JUL-14
8	Wardha - Aurangabad-I	D/C	PGCIL	690	JUL-14
9	Satna - Gwalior line (60 Km D/C Portion) Ckt-II	D/C+S/C	PGCIL	300	AUG-14
10	Kurnool - Nellore	D/C	PGCIL	602	OCT-14
11	Kurnool - Thiruvalam line	D/C	PGCIL	710	NOV-14
12	Raipur Pooling Station - Wardha line	D/C	PGCIL	736	NOV-14
13	Sholapur - Pune	S/C	PGCIL	268	FEB-15
14	Angul Pooling Station - Jharsuguda Pooling Station line-I	S/C	PGCIL	274	MAR-15
15	Vindhyachal Pooling Station - Satna line (2 Km D/C Portion) Ckt-I	D/C+S/C	PGCIL	271	MAR-15
16	Wardha - Aurangabad -II	D/C	PGCIL	701	MAR-15
Total of CENTRAL Sector				**5912**	
PVT SECTOR					
17	Raichur - Sholapur line	S/C	RSTCL	208	JUN-14
18	Akola - Aurangabad line ckt-I	S/C	APL	219	AUG-14
19	Aurangabad - Dhule (BDTCL)	S/C	SGL	192	OCT-14
20	Bhopal - Indore (BDTCL)	S/C	SGL	176	OCT-14
21	Dhule - Vadodara (BDTCL)	S/C	SGL	263	FEB-15
22	Tiroda - Koradi - Akola - Aurangabad line ckt-II	S/C	APL	575	MAR-15
Total of PVT Sector				**1633**	
STATE SECTOR					
23	Anpara C - Anpara D	S/C	UPPTCL	3	JUN-14
Total of STATE Sector				**3**	
Total of 765 kV				**7548**	
400 kV					
CENTRAL SECTOR					
24	Aurangabad (PG)-Aurangabad (MSETCL)	D/C	PGCIL	118	APR-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
25	LILO of Teesta-V Siliguri line at Rangpo (1 D/C & 1.5 M/C)	D/C	PGCIL	7	APR-14
26	Nellor - Thiruvalam (Quad) line	D/C	PGCIL	352	APR-14
27	LILO of 2nd Ckt of Lucknow - Bareliiy line (PG) at Shahjahanpur	D/C	PGCIL	25	JUN-14
28	LILO of Neyveli - Trichy at Nagapattnam Pooling station	S/C	PGCIL	46	JUN-14
29	Thiruvalam - Sholinganallur line	D/C	PGCIL	228	JUL-14
30	Anuppur (Moser Baer) - Jabalpur Pooling Station	D/C	PGCIL	492	AUG-14
31	Dadr-Loni (Harsh Vihar)	S/C	NTPC Ltd.	108	SEP-14
32	Koderma - Gaya (Balance part)	D/C	PGCIL	152	SEP-14
33	Maithon -Gaya line (Balance part)	D/C	PGCIL	130	SEP-14
34	Balipara - Bongaigaon	D/C	PGCIL	609	OCT-14
35	LILO of Both Ckt Jamshedpur - Rourkela line at Chaibasa	D/C	PGCIL	56	OCT-14
36	LILO of Nathpa Jhakri - Nalagarh at Rampur (2nd Ckt balance)	D/C	PGCIL	2	OCT-14
37	LILO of Teesta-V Siliguri line at Rangpo (2nd ckt balance)	D/C	PGCIL	5	OCT-14
38	LILO of Navsai - Boisar at Magarwada	D/C	PGCIL	16	NOV-14
39	Bokaro TPS Extn.- Koderma TPS	D/C	PGCIL	200	DEC-14
40	Sagardighi - Baharampur	D/C	PGCIL	52	DEC-14
41	Bachou - Varsana line	D/C	PGCIL	20	JAN-15
42	LILO of both ckts of Tuticorin JV - Maduri at Tuticorin Pooling station	D/C	PGCIL	9	JAN-15
43	Sikar - Ratnagarh line	D/C	PGCIL	156	JAN-15
44	LILO of Parli - Pune at Pune	D/C	PGCIL	39	FEB-15
45	LILO of Dehar - Panipat at Panchkula	D/C	PGCIL	18	MAR-15
46	Silchar - Imphal (New) line (to be charged at 132KV)	D/C	PGCIL	334	MAR-15
Total of CENTRAL Sector				**3174**	
JOINT SECTOR					
47	Koldam - Ludhinana (JV Portion)	D/C	PKTCL	301	SEP-14
48	Parbati -II- Koldam line -II	S/C	PKTCL	76	SEP-14
49	Parbati- II - Koldam line-I	S/C	PKTCL	81	OCT-14
Total of JOINT Sector				**458**	
PVT SECTOR					
50	LILO of ACBIL-Baraari (Bilaspur) PS at Bandakhar (Maruti Clean Coal)	D/C	MCCPL	6	JUN-14
51	Byrnihat - Azara (2nd Ckt) (Part of Silchar - Azara)	S/C	NETC	42	JUL-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
52	Bhopal - Bhopal (BDTCL)	D/C	SGL	17	JUL-14
53	DB Power (Baradarha) - Raigarh (Kotra) Pooling Station	D/C	DBPCL	36	AUG-14
54	LILO of one ckt of Bhadravati (PG) - Parli at Dhariwal	D/C	DIPL	31	AUG-14
55	Derang - Angul Pooling Station	MC+D/C	JPL	154	AUG-14
56	Dhule (IPTC) - Dhule (MSETCL) (BDTCL)	D/C	SGL	35	SEP-14
57	Bongaigoan - Siliguri Line (ENICL)	D/C	SGL	443	NOV-14
58	Kamalanga (GMR) - Angul pooling station	D/C	GMR ENERG	60	DEC-14
59	Haldia - Subhasgram line	D/C	CESC	178	JAN-15
60	Dhariwal TPS -Channdrapur II (2nd Ckt)	S/C	DIPL	10	JAN-15
61	Tamnar TPP - Raigarh (Tamnar) Pooling Station	2xD/C	JPL	44	JAN-15
62	Bina TPS - Suitable location (along Bina (PG) - Bina (MPPTCL)	D/C	JV(PG&JP)	40	JAN-15
63	Termination of Ckt of above at Bina (PG) & other ckt at Bina (MPTCL)	D/C	JV(PG&JP)		JAN-15
64	Azara - Bongaigaon (2nd Ckt)	D/C	NETC	159	JAN-15
65	Amravati - Akola (Bableshwar) - I	D/C	IBPL	207	MAR-15
66	Satpura - Ashta	D/C	KPTL	482	MAR-15
67	Azara - Bongaigaon	D/C	NETC	201	MAR-15
Total of PVT Sector				**2145**	
STATE SECTOR					
68	Moga- Nakodar	D/C	PSTCL	128	APR-14
69	LILO of Waluj - Bhusawal at Thaptitanda	D/C	MSETCL	154	MAY-14
70	Thaptitanda (Aurangabad -II) - Ektuni	D/C	MSETCL	9	MAY-14
71	Nakodar - Makhu line	D/C	PSTCL	105	MAY-14
72	Rajpura Thermal - Nakodar	D/C	PSTCL	279	MAY-14
73	Babhaleshwar - Aurangabad II	D/C	MSETCL	254	JUL-14
74	Mukatsar -Makhu	D/C	PSTCL	191	JUL-14
75	Karaikudi - Kayathar	D/C	TANTRANSCO	390	JUL-14
76	Pugalur - Ottiyambakkam - Kalivanthapattu (Melakottaiyur)	D/C	TANTRANSCO	727	JUL-14
77	Kosamba-Chorania line	D/C	GETCO	460	AUG-14
78	Talwandi Sabo-Mukatsar	D/C	PSTCL	201	SEP-14
79	Chhegaon - Julwania	D/C	MPPTCL	225	NOV-14
80	LILO of Muzaffarnagar - Vishnuprayag at Srinagar	D/C	UPPTCL	7	NOV-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
81	LILO of Palatana - Bongaigaon at Azara S/S	D/C	AEGCL	7	JAN-15
82	Chhabra TPS - Anta (Baran)	D/C	RVPNL	179	JAN-15
83	MTPS Stage-III - Thiruvalam	D/C	TANTRANSCO	204	JAN-15
84	LILO of Panki - Muradnagar at Aligarh	D/C	UPPTCL	66	JAN-15
85	Bonapally - Chittoor (Quad)	D/C	APTRANSCO	196	FEB-15
86	LILO of Mundra - Chorania at Halvad S/S	D/C	GETCO	4	FEB-15
87	a) Jujjuru - Sattenapalli (b) LILO of VTS - Srisailam line at Sattenapalli	D/C	APTRANSCO	134	MAR-15
88	Mundra - Zerda line (Terminated at Varsana)	D/C	GETCO	161	MAR-15
89	Bara - Meza line	D/C	UPPTCL	65	MAR-15
90	LILO of Panki - Obra at Rewa Road	D/C	UPPTCL	1	MAR-15
91	Rewa Road - Meza line	D/C	UPPTCL	68	MAR-15
Total of STATE Sector				**4215**	
Total of 400 kV				**9992**	
220 kV					
CENTRAL SECTOR					
92	Gola - Ramgarh	D/C	DVC	74	MAY-14
93	LILO of Ckt-II Jullandhur - Hamirpur at Hamirpur (PG)	D/C	PGCIL	19	FEB-15
Total of CENTRAL Sector				**93**	
PVT SECTOR					
94	GEPL -MIDC S/S	D/C	GEPL	20	SEP-14
Total of PVT Sector				**20**	
STATE SECTOR					
95	LILO of Moga - Ferozepur at Talwandi Bhai	D/C	PSTCL	4	APR-14
96	LILO of Debari - Banswara at Madri (Udaipur)	D/C	RVPNL	34	APR-14
97	LILO of Arasur-Ingur at Karamadai S/S	D/C	TANTRANSCO	5	APR-14
98	LILO of Muradnagar - Modipuram at Faridnagar	S/C	UPPTCL	31	APR-14
99	Dhuri (Bhalwan) - Dhanaula	D/C	PSTCL	75	MAY-14
100	LILO of Dhuri - Bangan at Chhajali (Loop out)	S/C	PSTCL	27	MAY-14
101	Nakodar - Nurmehal	D/C	PSTCL	30	MAY-14
102	Ajari - Bhadla line	D/C	RVPNL	48	MAY-14
103	Bap-Ajari line	D/C	RVPNL	57	MAY-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
104	LILO of Ratangarh -Bikaner at Bandnu	D/C	RVPNL	42	MAY-14
105	Narasaraopet - Parchur	D/C	APTRANSCO	106	JUN-14
106	Makhu - Dharam kot	D/C	PSTCL	42	JUN-14
107	Patti - Algon (2nd Ckt)	S/C	PSTCL	20	JUN-14
108	LILO of Khodri - Rishikesh at Dehradun	D/C	PTCUL	5	JUN-14
109	Lalitpur TPS - Jhansi	D/C	UPPTCL	185	JUN-14
110	Terminating tower point - HSR Layout (Cable work)	UG Cable	KPTCL	3	JUL-14
111	LILO of Baja khana - Mukatsar at Kotkapura	D/C	PSTCL	3	JUL-14
112	Kashipur - Mahuakheraganj	D/C	PTCUL	34	JUL-14
113	LILO of Kayathar - Anuppankulam at Kayathar	D/C	TANTRANSCO	4	JUL-14
114	LILO of Kayathar - Pasumalai at Kayathar	D/C	TANTRANSCO	4	JUL-14
115	LILO of Thudiyalur - Othakalmandapam at Coimbatore	D/C	TANTRANSCO	10	JUL-14
116	Korba -Vishrampur	S/C	CSPTCL	153	AUG-14
117	LILO of Raigarh - Jindal (Tamnar) at Girwani	D/C	CSPTCL	15	AUG-14
118	Shalimar bagh - Wazirpur, U/G,1000 mm, 200 MW	D/C	DTL	8	AUG-14
119	LILO of GAVASAD - SLPP at Karjan	D/C	GETCO	23	AUG-14
120	LILO of Karamsad-Vartej at Dhuvaran CCPP-III	D/C	GETCO	78	AUG-14
121	LILO of Dausa -Alwar at Alwar	D/C	RVPNL	9	AUG-14
122	LILO of Mandawar-Alwar (MIA) at Alwar	D/C	RVPNL	1	AUG-14
123	LILO of Thiruvalam - Kanchipuram SP Koil at Thiruvalam	D/C	TANTRANSCO	10	AUG-14
124	LILO of Harduagani - Hathras at Khair	D/C	UPPTCL	75	AUG-14
125	LILO of Rewan Road - Fatehpur at Sirathu	S/C	UPPTCL	6	AUG-14
126	Hura - Raghunathpur	D/C	WBSETCL	67	AUG-14
127	BTPS-Agia-Sarusajai (2nd Circuit, Balance portion)	S/C	AEGCL	65	SEP-14
128	LILO of Budidampad - Bhongiri at Weddekothapally	D/C	APTRANSCO	14	SEP-14
129	Kanti - Darbhanga (2nd Ckt)	S/C	BSEB	68	SEP-14
130	LILO of Bawana-Najafgarh at Kanjhawla	D/C	DTL	6	SEP-14
131	Maharani Bagh- Gazipur (0.5kM cable on Maharani Bagh side & 8.5kM OH line)	D/C	DTL	19	SEP-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
132	LILO of New Pallom-Kayamkulam at Punnapra	D/C	KSEB	36	SEP-14
133	Khaperkheda - Butibori -I	D/C	MSETCL	126	SEP-14
134	Purti - Butibori - III	D/C	MSETCL	78	SEP-14
135	Bhawad - Bhopalgarh	D/C	RVPNL	93	SEP-14
136	Ghazipur - Rasra	S/C	UPPTCL	59	SEP-14
137	LILO of Obra - Allahabad II Ckt at Mizrapur	D/C	UPPTCL	8	SEP-14
138	LILO of Thiruvalam - Singarapet at Thiruvalam	D/C	TANTRANSCO	20	OCT-14
139	LILO of Moradabad - CB Ganj at Rampur	D/C	UPPTCL	24	OCT-14
140	LILO of Muzaffarngr - Nara -II ckt at Jansath	D/C	UPPTCL	20	OCT-14
141	Puricha - Jhansi	D/C	UPPTCL	14	OCT-14
142	Manubolu - Sullurpeta	D/C	APTRANSCO	136	NOV-14
143	LILO of one ckt of Badshahpur - Bhiwadi at HSIIDC Bawal	D/C	HVPNL	36	NOV-14
144	Daloda - Mandsaur	D/C	MPPTCL	14	NOV-14
145	LILO of Jabalpur (Sukha) - Birsinghpur / Amarkantak at Panagar	D/C	MPPTCL	7	NOV-14
146	LILO of Jeur - Karkambh at Shinde SKS	D/C	MSETCL	5	NOV-14
147	Aau-Baithwasia	D/C	RVPNL	93	NOV-14
148	Bhawad-Baithwasia	D/C	RVPNL	66	NOV-14
149	Jaipur (South -PG) - Vatika line	D/C	RVPNL	56	NOV-14
150	LILO of Ajmer -Beawer line at Ajmer	D/C	RVPNL	38	NOV-14
151	LILO of Bhilwara -Bali at Bamantukda	D/C	RVPNL	26	NOV-14
152	LILO of Duni - SEZ(220 KV GSS) line at Jaipur (south)(PG)	D/C	RVPNL	55	NOV-14
153	Ramgarh (GTPP) - Chandan	D/C	RVPNL	194	NOV-14
154	Harduaganj - Jahangirabad	D/C	UPPTCL	99	NOV-14
155	LILO of Tanda - Sultanpur at Tanda(New)	D/C	UPPTCL	8	NOV-14
156	LILO of Morbi - Lalpar at Sartanpar	D/C on M/C	GETCO	17	DEC-14
157	LILO of Tappar - Nani Khakhar at Mokha	D/C	GETCO	21	DEC-14
158	220 kV Apta - Kalwa line at Loc. No 647& 652 & 220 kV Kalwa - Taloja at Loc. No. 652 to 654 for Metra Rail Depot	S/C	MSETCL	4	DEC-14
159	Khadaki (VSNL - Dighi) - Theur-II line from Lonikand -I to Lonikand-II S/S	S/C	MSETCL	1	DEC-14

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
160	LILO of Hinjewadi - Infosys line at Pegasus	D/C	MSETCL	6	DEC-14
161	LILO of Kolhapur II - Mumewadi at Ghorpade	D/C	MSETCL	7	DEC-14
162	Shifting & height raising of 220 kV Kalwa - Taloja & 220 kV Kalwa - Apta line Loc. 652-653-654 for Metro rail Depot and Loc. No 647 to 652 metro rail at Panchananda	S/C	MSETCL	4	DEC-14
163	Tap on 220 kV Bhigwan-Kurkumbh at 220 kV Shirsuphal	S/C	MSETCL	5	DEC-14
164	Tarapur - Boisar line	S/C	MSETCL	1	DEC-14
165	Tarapur - Borivali line	S/C	MSETCL	1	DEC-14
166	Mendhasal-Bidanasi	D/C	OPTCL	62	DEC-14
167	LILO of 2nd Ckt of Patiala - Patran at Rajla	D/C	PSTCL	12	DEC-14
168	Sarna - Sujanpur line	D/C	PSTCL	9	DEC-14
169	Chandan - Dechu	D/C	RVPNL	202	DEC-14
170	LILO of Both ckt Viramgam - Bhat at Sanand	D/C	GETCO	22	JAN-15
171	Gurgaon Sector-72- Gurgaon Sector-20	D/C	HVPNL	24	JAN-15
172	LILO of Badod - Kota line & Badod - Modak line at Bhanpura	D/C	MPPTCL	4	JAN-15
173	LILO of Bina - Bhopal line at Ganjbasoda	D/C	MPPTCL	11	JAN-15
174	LILO of Narsinghpur - Itarsi at Pipariya	D/C	MPPTCL	9	JAN-15
175	Kadaperi - Kalivanthapattu line	S/C	TANTRANSCO	38	JAN-15
176	LILO of K.R.Thoppur-Deviakurichi at Singapuram	D/C	TANTRANSCO	14	JAN-15
177	Gonda - Basti	S/C	UPPTCL	105	JAN-15
178	LILO of Botad - Vartej at Vallabhipur	D/C	GETCO	2	FEB-15
179	Gurgaon Sector-72- Gurgaon Sector-20 (2nd Ckt)	D/C	HVPNL	24	FEB-15
180	Ashta - Berchha (2nd Ckt)	D/C	MPPTCL	45	FEB-15
181	Ashta - Indore - II (Jetpura)	S/C on D/C	MPPTCL	199	FEB-15
182	Berchha - Shajapur -I	D/C	MPPTCL	20	FEB-15
183	LILO of Pandharpur - Malinagar at karkambh	D/C	MSETCL	3	FEB-15
184	LILO of Ras - Merta line at Jethana	D/C	RVPNL	39	FEB-15
185	CBE - Mandapam	D/C	TANTRANSCO	10	FEB-15
186	LILO of Kundha PH III - PUSHEP at Karamadai	D/C	TANTRANSCO	1	FEB-15
187	LILO of Dhanki - Veramgam at Dhanki	D/C	GETCO	1	MAR-15

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
188	LILO of Halvad - Bhimasar at Chardva	D/C	GETCO	2	MAR-15
189	LILO of Kadana - Dhansura at Modasa	2xD/C	GETCO	22	MAR-15
190	LILO of Navsari -Bhilad at Atul S/s	D/C	GETCO	9	MAR-15
191	LILO of one ckt Kosamba-Mobha line at Suva	D/C	GETCO	115	MAR-15
192	Hiriyur - Gowribidanur	D/C	KPTCL	241	MAR-15
193	Berchha - Shajapur -II	D/C	MPPTCL	20	MAR-15
194	Gwalior (PGCIL) - Gwalior-II	D/C	MPPTCL	3	MAR-15
195	Amravati - Badnera line (2 Ckt)	S/C	MSETCL	30	MAR-15
196	LILO of Gangapur - Malegaon (Satana) at Sakri (Shivajinagar)	D/C	MSETCL	55	MAR-15
197	LILO of Monga - Jagron at Himatpura	D/C	PSTCL	56	MAR-15
198	Mukatsar - Ghubaya	D/C	PSTCL	81	MAR-15
199	Nakodar - Kartarpur	D/C	PSTCL	55	MAR-15
200	Barmer - M/s Carins	S/C	RVPNL	23	MAR-15
201	Heerapura -Nala Power House (Upgradation)	D/C	RVPNL	9	MAR-15
202	LILO of one ckt of Bapp - Bhadla at Badisid	D/C	RVPNL	29	MAR-15
203	Sujangarh - Tehendesar (GSS)	S/C	RVPNL	53	MAR-15
204	LILO of Lucknow - Sitapur at BKT	D/C	UPPTCL	3	MAR-15
205	Lalitpur TPS - Lalitpur TPS S/S (Ckt-I)	D/C	UPPTCL	19	MAR-15
Total of STATE Sector				**4445**	
Total of 220 kV				**4558**	

Annex-6.3 (B)

Sub-stations Completed During - 2014-2015

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
765 kV					
CENTRAL SECTOR					
1	Dharamjaygarh/ Korba Pooling station	765/400	PGCIL	1500	JUN-14
2	Kurnool S/S	765/400	PGCIL	3000	JUN-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
3	Aurangabad ICT-II	765/400	PGCIL	1500	JUL-14
4	Dharamjaygarh/ Korba Pooling station ICT -II	765/400	PGCIL	1500	JUL-14
5	Jharsuguda Pooling Station	765/400	PGCIL	1500	JUL-14
6	Jharsuguda (2nd ICT)	765/400	PGCIL	1500	OCT-14
7	Nellore I & II - ICT	765/400	PGCIL	3000	OCT-14
8	Sholapur (GIS) S/S	765/400	PGCIL	3000	FEB-15
9	Angul Pooling Station. S/S (4x1500)	765/400	PGCIL	1500	MAR-15
10	Bareilly (ICT-II)	765/400	PGCIL	1500	MAR-15
11	Thiruvalam S/S (2x1500)	765/400	PGCIL	1500	MAR-15
12	Vindhyachal Pooling Station (ICT-I)	765/400	PGCIL	1500	MAR-15
Total of CENTRAL Sector				22500	
PVT SECTOR					
13	Agaria (Bhopal) (2x1500)	765/400	SGL	3000	JUL-14
14	Dhule S/S (BDTCL) (2x1500)	765/400	SGL	3000	SEP-14
15	Koradi - III S/S	765/400	APL	3000	MAR-15
Total of PVT Sector				9000	
STATE SECTOR					
16	Anpara D. S/S	765/400	UPPTCL	1000	JUN-14
17	Anta (Distt. Banra) Pooling Station	765/400	RVPNL	3000	FEB-15
18	Phagi (jaipur South) (2x1500) S/S	765/400	RVPNL	3000	FEB-15
Total of STATE Sector				7000	
Toatl of 765 kV				38500	
400 kV					
CENTRAL SECTOR					
19	Rangpoo (GIS)	400/220	PGCIL	315	APR-14
20	Lakhisarai S/S (2nd Trf)	400/132	PGCIL	200	MAY-14
21	Rangpo (2nd ICT) S/S	400/220	PGCIL	315	MAY-14
22	Rangpo 3rd & 4th ICT	400/220	PGCIL	630	JUN-14
23	Shahajanpur	400/220	PGCIL	315	JUN-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
24	Navsari S/S	400/220	PGCIL	500	JUL-14
25	Rangpo ICT - V	400/220	PGCIL	315	JUL-14
26	Wanpoo ICT-II	400/220	PGCIL	315	JUL-14
27	Sahajahanpur (ICT-II) S/S	400/220	PGCIL	500	SEP-14
28	Allahabad (Aug.) S/S	400/220	PGCIL	315	OCT-14
29	Bassi (Aug.) S/S	400/220	PGCIL	500	OCT-14
30	Meerut (Aug.) S/S	400/220	PGCIL	500	OCT-14
31	Chaibasa S/S	400/220	PGCIL	315	NOV-14
32	Magarwada S/S	400/220	PGCIL	630	NOV-14
33	Boisor (Aug.) S/S	400/220	PGCIL	500	DEC-14
34	Chaibasa (ICT-II) S/S	400/220	PGCIL	315	JAN-15
35	Subhashgram (ICT) S/S	400/220	PGCIL	500	JAN-15
36	Wagoora S/Stn. 4th ICT (3x105) (Spare)	400/220	PGCIL	105	JAN-15
37	Bhadrawati (Aug.)	400/220	PGCIL	315	MAR-15
Total of CENTRAL Sector				7400	
STATE SECTOR					
38	Neelmangla (Addl. 3rd Trf.)	400/220	KPTCL	500	APR-14
39	Nakodar (1st Trf.)	400/220	PSTCL	315	APR-14
40	Nakodar(2nd Trf.)	400/220	PSTCL	315	MAY-14
41	Almathy (3rd ICT)	400/230	TANTRANSCO	315	MAY-14
42	Sungavarchatram 4th ICT	400/110	TANTRANSCO	200	JUN-14
43	Kayathar S/S	400/230	TANTRANSCO	315	JUL-14
44	Thiruvalam S/S	400/230	TANTRANSCO	315	JUL-14
45	Kayathar (Addl.) S/S	400/110	TANTRANSCO	200	AUG-14
46	Galwel S/S	400/220	APTRANSCO	315	SEP-14
47	Harsh Vihar (Loni) GIS (2x315)	400/220	DTL	630	SEP-14
48	Mukatsar (2x315)	400/220	PSTCL	630	SEP-14
49	Kayathar (2nd ICT)	400/220	TANTRANSCO	315	SEP-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
50	Greater Noida (Extn.)	400/132	UPPTCL	185	OCT-14
51	Hoody (3rd Trf) S/S	400/220	KPTCL	500	NOV-14
52	Julwania S/S	400/220	MPPTCL	630	NOV-14
53	Barmer (Aug) S/S	400/220	RVPNL	315	NOV-14
54	Chitorgarh S/S	400/220	RVPNL	315	NOV-14
55	Thiruvalam (2nd ICT)	400/230	TANTRANSCO	315	NOV-14
56	Madakkathara (3rd Trf.)S/S	400/220	KSEB	315	JAN-15
57	Ashta New (2nd Trf.)	400/220	MPPTCL	315	JAN-15
58	Vadavi S/S	400/220	GETCO	315	FEB-15
Total of STATE Sector				7570	
Toatl of 400 kV				14970	
220 kV					
CENTRAL SECTOR					
59	Rangpoo (GIS)	220/132	PGCIL	100	APR-14
60	Rangpo (2nd ICT) S/S	220/132	PGCIL	100	MAY-14
61	Rangpo 3rd ICT)	220/132	PGCIL	100	JUN-14
62	Purnea S/S	220/132	PGCIL	160	SEP-14
Total of CENTRAL Sector				460	
STATE SECTOR					
63	Ghulal (Addl.)) S/S	220/66	PSTCL	100	APR-14
64	Madri (Udaipur)	220/132	RVPNL	100	APR-14
65	Karamdai (New)	230/110	TANTRANSCO	100	APR-14
66	Faridnagar (New) S/S	220/132/33	UPPTCL	160	APR-14
67	Badnu (Upgradation)	220/132	RVPNL	160	MAY-14
68	Bundi (Addl.) S/S	220/132	RVPNL	100	MAY-14
69	Arasur 400KV S/S (4th ICT)	230/110	TANTRANSCO	100	MAY-14
70	Phursungi S/S	220/33	MSETCL	50	JUN-14
71	Dharamkot S/S	220/66	PSTCL	160	JUN-14
72	Kakrala (Addl.)	220/66	PSTCL	100	JUN-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
73	Rehana Jattan (Addl.)	220/66	PSTCL	100	JUN-14
74	Dehradun S/S	220/132	PTCUL	320	JUN-14
75	Podili S/S (Add Trf)	220/132	APTRANSCO	100	JUL-14
76	Chhuri (Korba)	220/132	CSPTCL	160	JUL-14
77	Kotkapura (New) S/S	220/66	PSTCL	100	JUL-14
78	Malout (Addl.)	220/66	PSTCL	100	JUL-14
79	Sandhaur (New) S/S	220/132	PSTCL	100	JUL-14
80	Coimbatore S/S	230/110	TANTRANSCO	100	JUL-14
81	Vishrampur S/S	220/132	CSPTCL	160	AUG-14
82	Pipariya S/S	220/132	MPPTCL	160	AUG-14
83	Rajgarh (Biora) (Addl) S/S	220/132	MPPTCL	160	AUG-14
84	Ratlam S/S	220/132	MPPTCL	160	AUG-14
85	Eachangadu S/S	230/110	TANTRANSCO	50	AUG-14
86	Pallakapalayam S/S	230/110	TANTRANSCO	200	AUG-14
87	Khair	220/132	UPPTCL	320	AUG-14
88	Nehtour	220/132	UPPTCL	100	AUG-14
89	Sirathu (Kaushambi)	220/132	UPPTCL	160	AUG-14
90	Sadasivpet S/S	220/132	APTRANSCO	100	SEP-14
91	Harsh Vihar GIS	220/66	DTL	320	SEP-14
92	Punnapra S/S	220/132	KSEB	200	SEP-14
93	Veerapuram S/S	230/110	TANTRANSCO	100	SEP-14
94	Firozabad (Extn.)	220/132	UPPTCL	23	SEP-14
95	Rampur S/S	220/132	UPPTCL	100	SEP-14
96	Sirsaganj (Firozabad) S/S	220/132/33	UPPTCL	100	SEP-14
97	Mirzapur S/S	220/132	UPPTCL	100	OCT-14
98	Noida Sec-20 S/S (Extn.)	220/132	UPPTCL	23	OCT-14
99	Noida Sec-62 (Addl.)	220/132	UPPTCL	63	OCT-14
100	Rasra (Balia) S/S	220/132	UPPTCL	320	OCT-14

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
101	Dairy Farm (Addl. Trf)	220/132	APTRANSCO	100	NOV-14
102	Gooty (Aug.) (160-100)	220/132	APTRANSCO	60	NOV-14
103	Ongole S/S (Aug.) (160-100)	220/132	APTRANSCO	60	NOV-14
104	Doma (Addl. Trf)	220/132	CSPTCL	160	NOV-14
105	Mungeli (160+40)	220/132	CSPTCL	200	NOV-14
106	Saraipali (Addl. Trf)	220/132	CSPTCL	160	NOV-14
107	Karjan (2nd Trf) S/S	220/66	GETCO	100	NOV-14
108	A-4 Faridabad (GIS)	220/66	HVPNL	200	NOV-14
109	Mahalgaon (Addl.)	220/132	MPPTCL	160	NOV-14
110	Algon (Addl.)	220/66	PSTCL	100	NOV-14
111	Chohla Sahib (Addl.) (Trf.)	220/132	PSTCL	100	NOV-14
112	Passiana (Addl..) S/S	220/132	PSTCL	100	NOV-14
113	Bhadla (UC 400 kV)	220/132	RVPNL	160	NOV-14
114	Bhadra S/S	220/132	RVPNL	50	NOV-14
115	Hanumangarh (Aug.) (160-100)	220/132	RVPNL	60	NOV-14
116	Nokha (Aug.) (160-100)	220/132	RVPNL	60	NOV-14
117	Sikar (Aug.) (160-100)	220/132	RVPNL	60	NOV-14
118	Pugalur (Addl.) (3rd Trf.)	230/110	TANTRANSCO	100	NOV-14
119	Gokarna (Aug) Add	220/132	WBSETCL	160	NOV-14
120	Hura (Addl.) (2nd Trf.)	220/132	WBSETCL	160	NOV-14
121	New Bishnupur (Aug) Add	220/132	WBSETCL	160	NOV-14
122	Nawada S/S	220/66	HVPNL	100	DEC-14
123	Manglore SEZ SS	220/110	KPTCL	200	DEC-14
124	Shirsuphal S/S	220/33	MSETCL	50	DEC-14
125	Coimbatore (Addil Trans.)	230/110	TANTRANSCO	100	DEC-14
126	Dhar S/S	220/132	MPPTCL	160	JAN-15
127	Ganj Basoda S/S	220/132	MPPTCL	160	JAN-15
128	Panagar S/S	220/132	MPPTCL	160	JAN-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
129	Anthiyur S/S	230/110	TANTRANSCO	100	JAN-15
130	Ambetha S/S	220/66	GETCO	50	FEB-15
131	Asoj S/S	220/66	GETCO	100	FEB-15
132	Charanka (Addl.)	220/66	GETCO	100	FEB-15
133	Dahej S/S	220/66	GETCO	100	FEB-15
134	Dhokadava (Kansari) S/S	220/66	GETCO	50	FEB-15
135	Hadala S/S	220/66	GETCO	50	FEB-15
136	Halvad (Addl.)	220/66	GETCO	60	FEB-15
137	Halvad S/S	220/66	GETCO	60	FEB-15
138	Jantral S/S	220/66	GETCO	60	FEB-15
139	Kim S/S	220/66	GETCO	50	FEB-15
140	Mitha S/S	220/66	GETCO	50	FEB-15
141	Mota (Bardoli)	220/66	GETCO	50	FEB-15
142	Rajkot Nayara S/S	220/66	GETCO	50	FEB-15
143	Tharad S/S	220/66	GETCO	50	FEB-15
144	Vadavi S/S	220/66	GETCO	100	FEB-15
145	Vapi S/S	220/66	GETCO	60	FEB-15
146	Wagra S/S	220/66	GETCO	50	FEB-15
147	Bhanpura S/S	220/132	MPPTCL	160	FEB-15
148	Pegasus S/S	220/22	MSETCL	25	FEB-15
149	Kotla Jangan (Aug.)	220/132	PSTCL	100	FEB-15
150	Mohali -I (Aug)	220/66	PSTCL	60	FEB-15
151	Bundi (Addl.) S/S	220/132	RVPNL	100	FEB-15
152	Gajner (Addl.) S/S	220/132	RVPNL	160	FEB-15
153	Padampur (Addl.)S/S	220/132	RVPNL	100	FEB-15
154	Karamadai (2nd auto)	230/110	TANTRANSCO	100	FEB-15
155	Karimangalam (3rd auto)	230/110	TANTRANSCO	100	FEB-15
156	Sempatty (3rd auto)	230/110	TANTRANSCO	100	FEB-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
157	Thiruvarur (Enhancement) S/S	230/110	TANTRANSCO	20	FEB-15
158	Shajapur - I S/S	220/132	MPPTCL	160	MAR-15
159	Baithwasia S/S	220/132	RVPNL	100	MAR-15
160	Bamantukda S/S	220/132	RVPNL	100	MAR-15
161	Bidisild S/S	220/132	RVPNL	160	MAR-15
162	Nala PH (Jaipur)	220/132	RVPNL	360	MAR-15
Total of STATE Sector				11624	
Toatl of 220 kV				12084	

Annex-6.4 (A)

Transmission Lines Completed During - 2015-2016

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
800 kV					
CENTRAL SECTOR					
1	+/- 800KV HVDC Biswanath Chariyali - Agra Bi-pole line	BIPOLE	PGCIL	3506	SEP-15
Total of CENTRAL Sector				**3506**	
Total of ?800 kV				**3506**	
765 kV					
CENTRAL SECTOR					
2	Sasan - Vindhyachal (PS)	S/C	PGCIL	6	APR-15
3	Meerut - Moga line	S/C	PGCIL	337	MAY-15
4	Raigarh Pooling Station (Near Kotra) - Champa Pooling Station line	S/C	PGCIL	96	MAY-15
5	Gwalior - Jaipur (Ckt 1)	S/C	PGCIL	305	AUG-15
6	Gwalior - Jaipur line (Ckt 2)	S/C	PGCIL	311	AUG-15
7	Jaipur - Bhiwani line	S/C	PGCIL	272	AUG-15
8	Rihand - Vindhyachal Pooling Station (2nd Ckt)	D/C	PGCIL	31	AUG-15
9	Vindhyachal Pooling Station - Satna Ckt-II	S/C	PGCIL	271	AUG-15
10	Aurangabad - Solapur line	D/C	PGCIL	556	SEP-15

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
11	Dharamjaygarh - Jabalpur Pooling Station line	D/C	PGCIL	848	SEP-15
12	Narendra (New, Kudgi) - Kolhapur (new)	D/C	PGCIL	374	NOV-15
13	Kurnool (New) - Raichur line	D/C	PGCIL	120	DEC-15
14	Ranchi (New) - Dharamjaygarh /Near Korba	S/C	PGCIL	341	DEC-15
15	Angul Pooling Station - Jharsuguda Pooling Station line-II	S/C	PGCIL	284	JAN-16
16	Balia - Varanasi	S/C	PGCIL	165	MAR-16
17	LILO of Gaya - Fatehpur at Varanasi S/S	S/C	PGCIL	7	MAR-16
Total of CENTRAL Sector				**4324**	
PVT SECTOR					
18	Jabalpur - Bhopal (BDTCL)	S/C	SGL	274	JUN-15
19	Jabalpur - Bina (JTCL)	S/C	SGL	245	JUN-15
20	Dhramjaygarh - Jabalpur (JTCL)	D/C	SGL	758	SEP-15
Total of PVT Sector				**1277**	
Total of 765 kV				**5601**	
400 kV					
CENTRAL SECTOR					
21	400 kV D/C trans. Line for swapping of Kahalgaon #1 bay with Sasaram# 1 bay at Biharshariff S/Stn.	D/C	PGCIL	20	APR-15
22	Bareilly - Kashipur line (Quad)	D/C	PGCIL	202	APR-15
23	Sholapur STPP - Sholapur line-I	D/C	PGCIL	22	APR-15
24	Barh-II - Gorakhpur	D/C	PGCIL	698	MAY-15
25	LILO of Moga - Bhiwani at Hissar line	D/C	PGCIL	4	JUN-15
26	LILO of One Ckt of Baripada - Mendhasal line at Dubri (OPTCL)	D/C	PGCIL	32	JUL-15
27	LILO of Dehar - Bhiwani at Rajpura (PSTCL)	S/C	PGCIL	29	JUL-15
28	Silchar - Purba Kanchan Bari line (charged at 132KV)	D/C	PGCIL	254	JUL-15
29	Vijayawada - Nellore line	D/C	PGCIL	661	JUL-15
30	LILO of 2nd ckt of Neyveli - Trichy at Nagapattnam	D/C	PGCIL	46	AUG-15
31	Salem Pooling Station - Salem	D/C	PGCIL	120	AUG-15
32	Balipara - Biswanath Chariyali	D/C	PGCIL	114	SEP-15
33	Mysore - Kozhikode	D/C	PGCIL	420	SEP-15
34	Bhiwani - Hissar line	D/C	PGCIL	113	OCT-15
35	LILO of Ranganadi - Balipara 400KV D/C line at Biswanath Chariyali (Pooling Point)	D/C	PGCIL	114	OCT-15

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
36	Gooty - Madhugiri	D/C	PGCIL	418	NOV-15
37	Kurukshetra - Jallandhar (Ckt-I)	D/C	PGCIL	266	NOV-15
38	LILO of Abdullapur - Sonepat at Kurukshetra (Tripal)	D/C	PGCIL	30	NOV-15
39	LILO of both ckt of Kolhapur - Mapusa at Kolhapur (new)	D/C	PGCIL	90	NOV-15
40	Narendra (New, Kudgi) - Narendra (Existing)	D/C	PGCIL	354	NOV-15
41	Kashipur - Roorkee line	S/C	PGCIL	302	DEC-15
42	Khamam - Nagarjunasagar line (By Vizag Transmission Ltd.)	D/C	PGCIL	290	JAN-16
43	Kurukshetra - Jallandhar (Ckt-II)	D/C	PGCIL	265	JAN-16
44	Surjamaninagar (Tripura) - Indo-Bangladesh Border line (operated at 132 kV)	D/C	PGCIL	35	JAN-16
45	Ext. of one ckt Biharshariff - Sasaram at Varanasi (Q)	D/C	PGCIL	251	MAR-16
46	Kishanganj - Patna line (Quad)	D/C	PGCIL	692	MAR-16
47	LILO of Meerut - Kaithal at Bagpat (Ckt-I)	D/C	PGCIL	61	MAR-16
48	LILO of Sasaram - Allabhadad at Varanasi (Q)	D/C	PGCIL	24	MAR-16
49	LILO of Siliguri (Existing) - Purnea at Kishanganj	D/C	PGCIL	16	MAR-16
50	NCC gen Sw Yd. - Nellore PS line (Q)	D/C	PGCIL	66	MAR-16
Total of CENTRAL Sector				**6009**	
PVT SECTOR					
51	LILO of both ckt, of Raigarh - Raipur at Akaltara TPP	2xD/C	KSK LTD.	71	APR-15
52	Jhabua Power TPS - Jabalpur Pooling Station.	D/C	JHAPL	131	MAY-15
53	Binjkote - Raigarh (Kotra) Pooling Station	D/C	SKS	55	MAY-15
54	KSK Mahanadi (Warda Power) - Champa Pooling Station	2xD/C	KSK LTD.	105	JUN-15
55	Raikheda (GMR) - Raipur Pooling Station	D/C	GMR ENERG	131	JUL-15
56	Rosa - Shahjehanpur (PG)	D/C	RPTL	16	JUL-15
57	Nasik - Bobleshwar (2nd Ckt)	D/C	IBPL	57	AUG-15
58	Kudgi STPS - Narendra	2xD/C	KTCL	36	AUG-15
59	LILO of one ckt Karcham wangto - Abdullapur at Sorang HEP	D/C	HSPPL	7	OCT-15
60	Rajgarh (PG) - Karamsad (GETCO)	D/C	RPTL	486	DEC-15
61	TRN (TPP) - Raigarh PS (Tamnar)	D/C	TRNE	30	JAN-16
Total of PVT Sector				**1125**	
STATE SECTOR					

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
62	LILO of One ckt of Korba (W) - Khedamara at Marwa	D/C	CSPTCL	116	MAY-15
63	Aurangabad (Ektuni - III) - Aurangabad -II (Thaptitanda) Ckt-II	S/C	MSETCL	5	MAY-15
64	LILO point of IEPL to LILO point of Warora-Wardha line	D/C	MSETCL	97	MAY-15
65	LILO of one ckt Palatana - Bongaigaon at Byrnihat line	D/C	MeECL	4	MAY-15
66	MTPS Stage-III - Thiruvalam (Ckt-II) (Balance)	D/C	TANTRANSCO	338	MAY-15
67	LILO of RTPS - Btps at YTPS	D/C	KPTCL	33	JUN-15
68	Karaikudi-Pugalur	D/C	TANTRANSCO	320	JUN-15
69	Krishnapatnam TPS-Chittoor(Balance)	D/C	APTRANSCO	180	JUL-15
70	Vizag TPP - Kalpaka	D/C	APTRANSCO	14	JUL-15
71	LILO of Moga-Hisar line at RGTPS Khedar	D/C	HVPNL	2	AUG-15
72	Meramundali-Duburi (1st Ckt)	D/C	OPTCL	192	AUG-15
73	Thiruvalam - Almathy	D/C	TANTRANSCO	143	AUG-15
74	Purushottapatnam (Nunna) - Jujjuru	D/C	APTRANSCO	112	OCT-15
75	Yemmiganur - Uravakonda	D/C	APTRANSCO	205	OCT-15
76	LILO of Kalpaka - Khammam at Asupaka	D/C	TSTRANSCO	34	OCT-15
77	Bikaner- Merta	S/C	RVPNL	172	NOV-15
78	LILO of Srisailam - Hyderabad (Ckt-I) atYeddumailaram (Shankarapally)	D/C	TSTRANSCO	158	NOV-15
79	Singareni TPS (Jaipur TPP) - Gajwel	D/C	TSTRANSCO	325	NOV-15
80	Jammalamadugu - Narnur (Kurnool)	D/C	APTRANSCO	202	DEC-15
81	LILO of Bhiwani - Bahadurgarh (PGCIL) at Kaboolpur S/S	D/C	HVPNL	13	DEC-15
82	LILO of Koradi II- Wardh(PG) at Bela TPP	D/C	MSETCL	49	DEC-15
83	Ib-Meramundali (Loc No. 122/0 to Meramundali)	D/C	OPTCL	418	DEC-15
84	Koradi TPS - Wardha	D/C	MSETCL	144	JAN-16
85	Mundra (Adani) - Zerda line 2	D/C	GETCO	671	FEB-16
86	LILO of Chandrapur - Parli ckt-II at Kumbhargaon (Nanded) S/S	D/C	MSETCL	88	FEB-16
87	LILO of VTS - Malkaram (Ckt-I) at Suryapet	D/C	TSTRANSCO	7	MAR-16
88	Anpara B-Anpara D (Ckt-I)	D/C	UPPTCL	5	MAR-16
Total of STATE Sector				**4047**	
Total of 400 kV				**11181**	
220 kV					
CENTRAL SECTOR					

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
89	Rangpo - New Melli line (Twin Moose) (20.5 D/C & 1.5 M/C)	MC+D/C	PGCIL	54	MAY-15
90	Mariani (New) - Mokikchung (PG)	D/C	PGCIL	97	JUN-15
91	Kodarma-Giridih	D/C	DVC	212	AUG-15
92	LILO of Siliguri - Dalkhola line at New Pooling Station Kishanganj	D/C	PGCIL	36	MAR-16
Total of CENTRAL Sector				**399**	
STATE SECTOR					
93	LILO of Korba - Vishrampur at Churri	D/C	CSPTCL	30	APR-15
94	Mundka -Peeragarhi U/G 200 mm, 250 MW	D/C	DTL	26	APR-15
95	LILO of Asoj - Karamsad at Mogar S/S	D/C	GETCO	15	APR-15
96	LILO of Shivlakha - Deodhar line at PS-2	D/C	GETCO	56	APR-15
97	Gurgaon Sector 72 (PGCIL) - Gurgaon Sector 72 (HVPNL)	D/C	HVPNL	1	APR-15
98	Gurgaon Sector 72 (PGCIL) - Gurgaon Sector 33 (HVPNL)	D/C	HVPNL	7	APR-15
99	LILO of Badshahpur - Bhiwadi - Mau line at Panchgaon	D/C	HVPNL	3	APR-15
100	LILO of Bina - Gwalior at Datia	D/C	MPPTCL	2	APR-15
101	Ahmednagar - Jeur (Kaudgaon)	S/C	MSETCL	53	APR-15
102	Babhaleshwar - Jeur (Kaudgaon)	S/C	MSETCL	87	APR-15
103	LILO of Waluj Bahaleshwar - Deogaon Rangari S/S	D/C	MSETCL	26	APR-15
104	Tapping on Lonand Kandalgaon for Lonand MIDC	S/C	MSETCL	1	APR-15
105	LILO of Both Ckt Malerkotla - Barnala at Sandhaur	D/C	PSTCL	12	APR-15
106	LILO of Both Ckt Malerkotla - Pakhowal at Sandhaur	D/C	PSTCL	13	APR-15
107	Sanganer- Sitapura (Upgradation) Ckt-II	D/C	RVPNL	11	APR-15
108	Kadapperi - Guindy (UG Cable)	S/C	TANTRANSCO	14	APR-15
109	LILO of 1st ckt of Shapurnagar - Gachibowlly line at Miyapur	D/C	TSTRANSCO	2	APR-15
110	Mamidipally - Fab city	D/C	TSTRANSCO	6	APR-15
111	LILO of Muzaffarnagar - Nara II at Jansath Ckt-II	D/C	UPPTCL	20	APR-15
112	Lalitpur - Lalitpur TPS (Ckt-II)	D/C	UPPTCL	19	APR-15
113	Muzaffarnagar - Nara Ckt-II	D/C	UPPTCL	12	APR-15
114	Masudpur-Samain line	D/C	HVPNL	91	MAY-15
115	Bhatinda - Mukatsar (2nd CKt)	D/C	PSTCL	23	MAY-15
116	LILO of one ckt Kotputli -Manoharpur at Kotputli (PG)	D/C	RVPNL	12	MAY-15

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
117	LILO of one ckt Neemrana -Kotputli at Behror	D/C	RVPNL	31	MAY-15
118	LILO of Shapur Nagar - Gachilbowli feeder at GIS Erragadda SS	DC UG cable	TSTRANSCO	19	MAY-15
119	Charanka - Jangral	D/C	GETCO	193	JUN-15
120	SSNNL PS-I - PS-2 (ACSR Zebra conductor)	D/C	GETCO	22	JUN-15
121	Dumka - Rupnarayanpur	D/C	JSEB	147	JUN-15
122	Damoh - Tikamgarh (2nd Ckt)	D/C	MPPTCL	158	JUN-15
123	LILO of Rewa - Ton at Sirmour	D/C	MPPTCL	10	JUN-15
124	Chinchwad - Apta	M/C	MSETCL	30	JUN-15
125	LILO (Tapping) of Dhule - Malegaon at Sayne	S/C	MSETCL	5	JUN-15
126	Shedyal - Jath line	D/C	MSETCL	37	JUN-15
127	Shivajinagar - Malegaon	S/C	MSETCL	114	JUN-15
128	Shivajinagar - Satana	S/C	MSETCL	96	JUN-15
129	Atri - Pandiabil	D/C	OPTCL	45	JUN-15
130	Talwandi - Dharamkot	D/C	PSTCL	63	JUN-15
131	LILO of Ajmer -Kishangarh line at Ajmer	D/C	RVPNL	11	JUN-15
132	LILO of Khetri - Heerapura line at Babai	D/C	RVPNL	5	JUN-15
133	LILO of Kuchamancity -Dhod at Deedwana	D/C	RVPNL	88	JUN-15
134	Arasur 400 kV S/S - Karamadai 230 kV S/S	S/C	TANTRANSCO	39	JUN-15
135	LILO of Kanjhawala - Najafgarh at Mundka 400 kV S/S	D/C	DTL	11	JUL-15
136	LILO of AD Hydro-Nalagarh at Fozal	D/C	HPPTCL	13	JUL-15
137	Mau - Balwal	D/C	HVPNL	37	JUL-15
138	LILO of Kandalgaon - Lonand at Lonand MIDC	D/C	MSETCL	8	JUL-15
139	Puri (Samangra) - Pandiabil	D/C	OPTCL	92	JUL-15
140	LILO of Dhuri - Bangan at Chhajali (Loop in)	D/C	PSTCL	29	JUL-15
141	LILO of Mandawar -Nadbai-Bharatpur at Chonkarwada	D/C	RVPNL	5	JUL-15
142	LILO of Alamathy - Koyembedut Thiruverkkadu	D/C	TANTRANSCO	2	JUL-15
143	LILO of Kalivanthapattu - Veerapuram at OMEGA	D/C	TANTRANSCO	39	JUL-15
144	LILO of Neyveli Zero unit - Neyveli - TS-II at Ulundurpet	S/C	TANTRANSCO	52	JUL-15
145	LILO of Shoolagiri - Singarapet at Gurabarapally	D/C	TANTRANSCO	2	JUL-15
146	LILO of Ulundurpet - STCMS at Ulundurpet	D/C	TANTRANSCO	68	JUL-15

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
147	LILO of both ckt Dindi - Chandrayangutta at Bonguloor	D/C	TSTRANSCO	2	JUL-15
148	LILO of One Ckt Langpi - Sarusajai at Sonapur	D/C	AEGCL	2	AUG-15
149	LILO of Pusouli (PG) - Ara (PG) at Pusouli (New)	D/C	BSEB	5	AUG-15
150	LILO of Raigarh - Budipadar line at Raigarh (PG)	D/C	CSPTCL	18	AUG-15
151	LILO of Kangasiyali - Nyara at Hadala	D/C	GETCO	33	AUG-15
152	LILO of one ckt Halvad - Morbi line to Bhimasar (PG) at Charadava S/S	D/C	GETCO	2	AUG-15
153	Sikka - Moti Paneli line	D/C	GETCO	157	AUG-15
154	LILO of Chinchwad - Phursungi at Kondhwa	D/C	MSETCL	1	AUG-15
155	LILO of Mhaisal - Jath at Mendhegiri S/S (Ckt-I)	D/C	MSETCL	20	AUG-15
156	Nanded - Waghala	D/C	MSETCL	30	AUG-15
157	Mukatsar - Abohar	D/C	PSTCL	87	AUG-15
158	Kotputli (PG) - Bansur	D/C	RVPNL	84	AUG-15
159	LILO of KTPS - Sanganer line at Vatika	D/C	RVPNL	11	AUG-15
160	LILO of Korattur - Koyambedu at Alamathy	D/C	TANTRANSCO	6	AUG-15
161	LILO of Manali - Basin Bridge (BBGTP) at Vyasarpadi	D/C	TANTRANSCO	1	AUG-15
162	Thimmapuram- Yellanur	D/C	APTRANSCO	8	SEP-15
163	Gurgaon Sector 72 - Nuh - Rangla Raipur (Ckt-I & II)	D/C	HVPNL	146	SEP-15
164	Sawangi - Bhokardhan	D/C	MSETCL	134	SEP-15
165	Debari - Salumber (2nd Ckt)	D/C	RVPNL	64	SEP-15
166	LILO of Korattur - Koyambedu at Alamathy (Balance Portion)	D/C	TANTRANSCO	23	SEP-15
167	220 kV LOC 49 of Roza-Hardoi to 220 Shahjehanpur	D/C	UPPTCL	20	SEP-15
168	LILO of Harduaganj- Khair (Aligarh) line at Boner	D/C	UPPTCL	6	SEP-15
169	LILO of khurja-NAPP-I line at Debai	D/C	UPPTCL	1	SEP-15
170	Amreli - Sukhpar line	D/C	GETCO	80	OCT-15
171	Chharodi - Ford line	D/C	GETCO	38	OCT-15
172	LILO on one ckt of Jamanwada - Varsana line at Ukheda S/s	D/C	GETCO	10	OCT-15
173	Varsana - Jamanwada line	D/C	GETCO	348	OCT-15
174	Ghatodi - Hingoli line	S/C	MSETCL	86	OCT-15
175	Khanapur length tap to Vita - Lamboti line	D/C	MSETCL	47	OCT-15
176	Jalore - Sayla	S/C	RVPNL	54	OCT-15

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
177	Neemrana-(PG)-Behror	D/C	RVPNL	54	OCT-15
178	Tehandesar(proposed)-Badnu	S/C	RVPNL	32	OCT-15
179	LILO of Alamathy - CMRL Koyembedu at Thiruverkkadu	D/C	TANTRANSCO	9	OCT-15
180	Kharagpur - Vidyasagar Park	D/C	WBSETCL	92	OCT-15
181	Appannadorapalem - Bobbili (Ckt-I)	D/C	APTRANSCO	84	NOV-15
182	Chhuri - Mopka (Bilaspur)	D/C	CSPTCL	189	NOV-15
183	Bhadreshwar - Varsana line	D/C	GETCO	104	NOV-15
184	Varsana - Mokha	D/C	GETCO	109	NOV-15
185	LILO of Sawangi - Bhokardan at Phulambri	D/C	MSETCL	11	NOV-15
186	New Bhusawal - Chalisgaon	D/C	MSETCL	258	NOV-15
187	Hindaun -Chonkarwada	D/C	RVPNL	72	NOV-15
188	LILO of Alwar -Kotputli at Bansur	D/C	RVPNL	2	NOV-15
189	Sanganer-Chaksu (Upgradation)	D/C	RVPNL	66	NOV-15
190	Badaun - Sambhal	S/C	UPPTCL	86	NOV-15
191	Gokarna - Krishnanagar	D/C	WBSETCL	210	NOV-15
192	LILO of existing Kalikiri - C.K.Palli at Thimmapuram S/S	D/C	APTRANSCO	2	DEC-15
193	A5(Faridabad) - A4(Faridabad) (Ckt-II)	D/C	HVPNL	8	DEC-15
194	LILO of one ckt Badshahpur - Mau - Bhiwadi at HSIIDC Bawal	D/C	HVPNL	39	DEC-15
195	Bagalkot - Gadag	D/C	KPTCL	193	DEC-15
196	LILO of Arasikere -Kanthenahalli at Arasikere S/S	D/C	KPTCL	8	DEC-15
197	LILO of Hubli - Lingapur 2nd Ckt at Gadag	D/C on M/C	KPTCL	15	DEC-15
198	LILO of Peenya - Hoody at Chikkabettahalli	M/C	KPTCL	11	DEC-15
199	Hinjewadi -II (400 kV) - Hinjewadi-II (220 kV) S/S	D/C	MSETCL	8	DEC-15
200	LILO of Amravati - Badnera line at Nandgaon Peth.	D/C	MSETCL	62	DEC-15
201	Goindwal Sahib - Chola Sahib	D/C	PSTCL	55	DEC-15
202	LILO of Nagaur -Merta at Kuchera	D/C	RVPNL	17	DEC-15
203	MTPS Stage-III - Thingalur	S/C	TANTRANSCO	92	DEC-15
204	LILO of 220 kV of Shamshabad - Firozabad at Agra (400 kV)	D/C	UPPTCL	6	DEC-15
205	LILO of Sarnath (400) - Azamgarh at Harhua	S/C	UPPTCL	42	DEC-15
206	LILO of both ckt of Balipara (PG) Samaguri at Sonabil	2xD/C	AEGCL	6	JAN-16
207	Namrup - Mariani	S/C	AEGCL	145	JAN-16

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
208	Kasor - Herang line	D/C	GETCO	39	JAN-16
209	Chikkodi-Kudachi	D/C	KPTCL	70	JAN-16
210	Kapnoor - Humnabad line	D/C	KPTCL	106	JAN-16
211	LILO of 220 kV Lonikand - Kathapur line at Lonikand-II	D/C	MSETCL	2	JAN-16
212	LILO of RSS - Warangal at Manthani	D/C	TSTRANSCO	60	JAN-16
213	LILO of Sultanpur - Phoolpur at Pratapgarh	D/C	UPPTCL	46	JAN-16
214	Pulivendula-Hindupur	D/C	APTRANSCO	250	FEB-16
215	Peeragarhi-Wazirpur U/G 1000 mm, 200 MW	D/C	DTL	17	FEB-16
216	LILO of Narendrapur - Mendhasal at Attri (Old Karadagadia)	D/C	OPTCL	5	FEB-16
217	Teesta LDP - IV - New Jalpaiguri (NJP)	D/C	WBSETCL	145	FEB-16
218	Kanti - Gopalganj (2nd Ckt.)	S/C	BSEB	101	MAR-16
219	Chaibasa - Chaibasa line	D/C	JSEB	1	MAR-16
220	Varahi -Khemar- Kavoor in the existing 110 kV corridor(balance portion)	D/C on M/C	KPTCL	245	MAR-16
221	LILO of One ckt of Bina - Guna at Ashoknagar	S/C	MPPTCL	8	MAR-16
222	Bhigwan - Walchandnagar	D/C	MSETCL	54	MAR-16
223	Bridgestone-II - Chakan-II	D/C	MSETCL	10	MAR-16
224	Diversion of Bhusawal - Chalisgaon along with existing Bhusawal - Chalisgaon line	D/C	MSETCL	1	MAR-16
225	Koradi TPS-New Khaparhkeda	D/C	MSETCL	28	MAR-16
226	Kumbhargaon - Waghala	D/C	MSETCL	31	MAR-16
227	LILO of Beed - Patoda at Manjarsumbha	D/C	MSETCL	9	MAR-16
228	LILO of Chitegaon - Shendra at Chitepimpalgaon (PG)	D/C	MSETCL	2	MAR-16
229	LILO of Kanhan - Bhandara at M/s Ultratech cement	D/C	MSETCL	1	MAR-16
230	LILO of One Ckt of Kolhapur - Sawantwadi at Mudhaltitta (Bidri)	D/C	MSETCL	13	MAR-16
231	LILO of Vita - Pandharpur at Bhalwani	D/C	MSETCL	26	MAR-16
232	Lamboti - Tuljapur	D/C	MSETCL	77	MAR-16
233	Lonikand-I - Lonikand -II	D/C	MSETCL	3	MAR-16
234	Nanded - Bhokar	D/C	MSETCL	74	MAR-16
235	Balchak - Naraingarh	D/C	PSTCL	33	MAR-16
236	LILO of Heerapura - Babai at Niwana	D/C	RVPNL	1	MAR-16
237	Renwal -Danta Ramgarh	S/C	RVPNL	33	MAR-16

Sl. No.	Name of Transmission Lines	Circuit Type	Executing Agency	Line Length (cKM)	Month of Completion
238	Avadi-Ayappakkam line	S/C	TANTRANSCO	3	MAR-16
239	LILO of Arasur (PG) - Karamadai at Karuvalur	D/C	TANTRANSCO	1	MAR-16
240	LILO of K.R. Thoppur - Ingur at Thingalur	D/C	TANTRANSCO	44	MAR-16
241	Gajokhar-Jaunpur	S/C on D/C	UPPTCL	37	MAR-16
242	LILO of Harduagani - Hathras at Aligarh	D/C	UPPTCL	43	MAR-16
243	Shahjahanpur - Nighasan	S/C	UPPTCL	155	MAR-16
244	LILO of one ckt of Jeerat - Rishra at Dharampur	S/C	WBSETCL	4	MAR-16
245	Subhasgram- Saintala	D/C	WBSETCL	25	MAR-16
Total of STATE Sector				**7427**	
Total of 220 kV				**7826**	

Annex-6.4 (B)

Sub-Stations Completed During - 2015-2016

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
1	**2**	**3**	**4**	**5**	**6**
800 kV					
CENTRAL SECTOR					
1	Biswanath Chariyali & Agra HVDC terminal (Pole-I)	?800	PGCIL	1500	NOV-15
Total of CENTRAL Sector				1500	
Toatl of 800 kV				1500	
765 kV					
CENTRAL SECTOR					
2	Angul (ICT-II)	765/400	PGCIL	1500	APR-15
3	Bareilly (ICT-I)	765/400	PGCIL	1500	APR-15
4	Thiruvalam S/S	765/400	PGCIL	1500	APR-15
5	Angul (ICT-III)	765/400	PGCIL	1500	MAY-15
6	Champa Pooling Station(ICT-I)	765/400	PGCIL	1500	JUN-15
7	Vadodara S/S	765/400	PGCIL	3000	JUN-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
8	Vindhyachal Pooling Station (ICT-II)	765/400	PGCIL	1500	AUG-15
9	Angul S/S (ICT-IV)	765/400	PGCIL	1500	JAN-16
10	Champa Pooling Station ICT-II	765/400	PGCIL	1500	MAR-16
11	Varanasi (GIS) S/S	765/400	PGCIL	3000	MAR-16
Total of CENTRAL Sector				18000	
STATE SECTOR					
12	Aurangabad - III (Ektuni) S/S	765/400	MSETCL	1500	MAR-16
Total of STATE Sector				1500	
Toatl of 765 kV				19500	
400 kV					
CENTRAL SECTOR					
13	Purnea (Aug.) (500-315)	400/220	PGCIL	160	JUN-15
14	Biswanath Chariyali S/S	400/132	PGCIL	200	SEP-15
15	Kozhikode S/Stn. (2x315)	400/220	PGCIL	630	OCT-15
16	Madhugiri S/S	400/220	PGCIL	1000	NOV-15
17	Muzaffarpur (ICT)	400/220	PGCIL	500	DEC-15
18	Agra S/S (Aug.)	400/220	PGCIL	315	JAN-16
19	Biswanath Chariyali S/S (ICT-II)	400/132	PGCIL	200	JAN-16
20	Bagpat (GIS) ICT-I S/S	400/220	PGCIL	500	MAR-16
21	Kishanganj ICT-I	400/220	PGCIL	500	MAR-16
22	Malekuttaiayur (Extn.)	400/220	PGCIL	500	MAR-16
23	Mandola (Aug.)ICT-I (4x500-4x315)	400/220	PGCIL	185	MAR-16
24	Panchkula	400/220	PGCIL	500	MAR-16
25	Purnea (Replacement) (500-315)	400/220	PGCIL	185	MAR-16
26	Sasaram (Pusali) (Replacement) ICT-I (500-315)	400/220	PGCIL	185	MAR-16
Total of CENTRAL Sector				5560	
PVT SECTOR					
27	Hazira S/S	400/220	EPTCL	1000	JUL-15
28	Rewa Road (GIS)	400/220	SEUPPTCL	630	NOV-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
Total of PVT Sector				1630	
STATE SECTOR					
29	Sarnath (Aug)	400/220	UPPTCL	500	APR-15
30	Sarojini Nagar (Aug.)	400/220	UPPTCL	75	APR-15
31	Kukurmara (Azara) S/S	400/220	AEGCL	630	MAY-15
32	Bareilly (Aug) (2x315) S/S	400/220	UPPTCL	315	MAY-15
33	Kharghar S/S	400/220	MSETCL	315	JUN-15
34	Nagda (Addl.)	400/220	MPPTCL	315	AUG-15
35	Duburi S/S	400/220	OPTCL	630	AUG-15
36	Muradnagar II (ICT-I)	400/220	UPPTCL	240	SEP-15
37	Aligarh S/s	400/220	UPPTCL	500	OCT-15
38	Katni (Addl.)	400/220	MPPTCL	315	NOV-15
39	Koradi -II (ICT-I)	400/220	MSETCL	500	NOV-15
40	Muradnagar - II (ICT-II) S/S	400/220	UPPTCL	240	DEC-15
41	Manubolu (Nellore) S/S	400/220	APTRANSCO	315	JAN-16
42	Chorania (Aug.) S/S	400/220	GETCO	500	JAN-16
43	Vadavi (Aug.) S/S	400/220	GETCO	315	JAN-16
44	Ajmer S/S	400/220	RVPNL	315	JAN-16
45	Mamidipalli S/S	400/220	TSTRANSCO	315	JAN-16
46	Mundka s/s(3rd 400/220 kV ICT)	400/220	DTL	315	FEB-16
47	Nanded (Kumbhargaon)S/S (ICT-I)	400/220	MSETCL	500	FEB-16
48	Raipur S/S (ICT I & II.)	400/220	CSPTCL	630	MAR-16
49	Bamnoli (ICT Replacement)	400/220	DTL	370	MAR-16
50	Asoj S/S	400/220/33	GETCO	500	MAR-16
51	Soja S/S	400/220/33	GETCO	500	MAR-16
52	Rishikesh (Aug.)	400/220	PTCUL	75	MAR-16
53	Suryapet S/S	400/220	TSTRANSCO	630	MAR-16
Total of STATE Sector				9855	
Toatl of 400 kV				17045	

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
220 kV					
CENTRAL SECTOR					
54	Mokokchung (New)	220/132	PGCIL	30	JUL-15
55	Mokokchung (ICT-II)	220/132	PGCIL	30	AUG-15
56	Ara (ICT)	220/132	PGCIL	160	DEC-15
57	Birpara (160-100) (Aug.)	220/132	PGCIL	60	DEC-15
58	Siliguri (160 - 100) (Aug.)	220/132	PGCIL	60	JAN-16
59	Girdih (2nd Trf.) S/S	220/132	DVC	150	MAR-16
60	Kalyaneswari S/S	220/132	DVC	160	MAR-16
61	Purnea (Replacements) (160-100)	220/132	PGCIL	60	MAR-16
62	Purnea ICT-II S/S	220/132	PGCIL	160	MAR-16
Total of CENTRAL Sector				870	
STATE SECTOR					
63	Hindupur (Aug.)	220/66	APTRANSCO	60	APR-15
64	Manubolu (Aug.)	220/66	APTRANSCO	100	APR-15
65	Peera Garhi (2x100)	220/33	DTL	200	APR-15
66	Daultabad	220/66	HVPNL	100	APR-15
67	Nawada (Addl.)	220/66	HVPNL	100	APR-15
68	Ambewadi (Aug.)	220/110	KPTCL	45	APR-15
69	Kemar (Aug.)	230/110	KPTCL	100	APR-15
70	Datia S/S	220/132	MPPTCL	160	APR-15
71	Gwalior-II (Banmore) S/S	220/132	MPPTCL	160	APR-15
72	Boisar S/S	220/33	MSETCL	50	APR-15
73	Butibori S/S	220/132	MSETCL	100	APR-15
74	Chinchwad S/S	220/22	MSETCL	50	APR-15
75	Coiourchem S/S	220/22	MSETCL	50	APR-15
76	Dhule S/S	220/33	MSETCL	25	APR-15
77	Kamba S/S	220/22	MSETCL	50	APR-15
78	Magarpatta S/S	220/132	MSETCL	100	APR-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
79	Nalasopara (Aug.)	220/22	MSETCL	100	APR-15
80	Pegasus S/S	220/22	MSETCL	25	APR-15
81	Raymond S/S	220/33	MSETCL	50	APR-15
82	Satana S/S	220/132	MSETCL	200	APR-15
83	Serum S/S	220/22	MSETCL	50	APR-15
84	Duburi S/S	220/33	OPTCL	40	APR-15
85	Banur (Aug.)	220/66	PSTCL	100	APR-15
86	Devigarh (Aug.) (2nd Addl.)	220/66	PSTCL	160	APR-15
87	Haridwar (Aug.) S/S	220/33	PTCUL	120	APR-15
88	Sitapura S/S	220/132	RVPNL	160	APR-15
89	Tehendesar S/S	220/132	RVPNL	100	APR-15
90	Anthiyur (Addl.)	230/110	TANTRANS CO	100	APR-15
91	Guindy (GIS) (New) S/S	230/110	TANTRANS CO	200	APR-15
92	Thondayarpet (Addl)	230/110	TANTRANS CO	100	APR-15
93	Fabcity S/S	220/132	TSTRANSC O	150	APR-15
94	Miyapur S/S	220/132	TSTRANSC O	160	APR-15
95	B.K.T Lucknow (Now)	220/132	UPPTCL	120	APR-15
96	Chibramau (Aug.)	220/132	UPPTCL	60	APR-15
97	Jansath, Muzaffarnagar (New)	220/132	UPPTCL	200	APR-15
98	sarojini Nagar (Aug.)	220/132	UPPTCL	60	APR-15
99	Kudus -II (Addl.) S/S	220/33	MSETCL	100	MAY-15
100	Abohar S/S	220/66	PSTCL	100	MAY-15
101	Aau S/S	220/132	RVPNL	160	MAY-15
102	Alandur (GIS) S/S	220/110	TANTRANS CO	100	MAY-15
103	Erragadda (3x160)	220/132	TSTRANSC O	160	MAY-15
104	B.K.T. (Aug) -II	220/132	UPPTCL	60	MAY-15
105	Mirzapur (Aug.) - II	220/132	UPPTCL	100	MAY-15
106	RPH (Aug). S/S	220/132	UPPTCL	60	MAY-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
107	Sahibabad (Aug.)	220/132	UPPTCL	40	MAY-15
108	Shamli (Aug.) S/S	220/132	UPPTCL	40	MAY-15
109	Agiyol (Aug.)	220/66	GETCO	50	JUN-15
110	Asoj (Aug.)	220/132	GETCO	150	JUN-15
111	Dhangadhra (Aug.)	220/66	GETCO	60	JUN-15
112	Dhasa (Aug.)	220/66	GETCO	60	JUN-15
113	Jamnagar (Aug.)	220/66	GETCO	60	JUN-15
114	Jangral (Aug.)	220/66	GETCO	60	JUN-15
115	Manjuvas S/S	220/11	GETCO	50	JUN-15
116	Radhanpur (Aug.)	220/66	GETCO	50	JUN-15
117	Rajkot (Nyara) (Aug.)	220/66	GETCO	60	JUN-15
118	Wagra (Aug.)	220/66	GETCO	50	JUN-15
119	Dumka S/S	220/132	JSEB	300	JUN-15
120	Pithampur S/S	220/132	MPPTCL	160	JUN-15
121	Sayane S/S	220/33	MSETCL	25	JUN-15
122	Chhajali (Aug.) (Addl.) S/S	220/66	PSTCL	100	JUN-15
123	Ghobaya S/S	220/66	PSTCL	50	JUN-15
124	Tanda (New) S/S	220/132	UPPTCL	320	JUN-15
125	Bakreswar S/S	220/33	WBSETCL	50	JUN-15
126	Khoday Glass Factory	220/66	KPTCL	300	JUL-15
127	Mendhasal S/S	220/33	OPTCL	100	JUL-15
128	Puri (Samangara) S/S	220/132	OPTCL	160	JUL-15
129	Rengali S/S	220/33	OPTCL	20	JUL-15
130	GNDTP Bathinda (Aug.)	220/66	PSTCL	100	JUL-15
131	Mahilpur (Aug.)	220/66	PSTCL	100	JUL-15
132	S.P.Koil (3rd Auto) (Aug.)	230/110	TANTRANSCO	20	JUL-15
133	Erragadda (2nd) S/S	220/132	TSTRANSCO	160	JUL-15
134	Sirathu S/S	220/132	UPPTCL	160	JUL-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
135	Bina S/S	220/132	MPPTCL	160	AUG-15
136	Julwania S/S	220/132	MPPTCL	160	AUG-15
137	Mendhegiri S/S	220/33	MSETCL	100	AUG-15
138	Mulund S/S	220/22	MSETCL	50	AUG-15
139	Shedyal S/S	220/33	MSETCL	100	AUG-15
140	Tilwani S/S	220/33	MSETCL	50	AUG-15
141	Alandur (CMRL)	220/110	TANTRANS CO	100	AUG-15
142	Bhelupur (New). S/S	220/33	UPPTCL	60	AUG-15
143	Lalitpur S/S	220/132	UPPTCL	200	AUG-15
144	Rampur -II (Extn.)	220/132	UPPTCL	100	AUG-15
145	Indore (Aug.) S/S	220/132	MPPTCL	40	SEP-15
146	Colourchem ICT - II S/S	220/22	MSETCL	50	SEP-15
147	Shedyal ICT-II S/S	220/33	MSETCL	100	SEP-15
148	Vatika S/S	220/132/33	RVPNL	160	SEP-15
149	Boner (New) ICT-I	220/132	UPPTCL	100	SEP-15
150	Debai (ICT-I) S/S	220/132	UPPTCL	100	SEP-15
151	Dewas S/S	220/132	MPPTCL	160	OCT-15
152	Kudus-II (2nd T/F)	220/33	MSETCL	100	OCT-15
153	Sayla S/S	220/132/33	RVPNL	160	OCT-15
154	Thiruverkkadu	230/110	TANTRANS CO	200	OCT-15
155	Modipuram (Aug) (200-160)	220/132	UPPTCL	40	OCT-15
156	New Jalpaiguri (NJP) (Aug.) S/S	220/132	WBSETCL	160	OCT-15
157	Bobbili (Vizianagaram)	220/132	APTRANSC O	100	NOV-15
158	Atul (Navera) S/S	220/66	GETCO	320	NOV-15
159	Modasa S/S	220/66	GETCO	260	NOV-15
160	Fozal S/S	220/33	HPPTCL	126	NOV-15
161	Anuppur (Addl.) S/S	220/132	MPPTCL	160	NOV-15
162	Chhindwara (Addl.) S/S	220/132	MPPTCL	160	NOV-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
163	Sirmour S/S	220/132	MPPTCL	160	NOV-15
164	Shirsuphal S/S	220/22	MSETCL	50	NOV-15
165	Kharar (Aug.)	220/66	PSTCL	60	NOV-15
166	Salem (Aug.)	220/110	TANTRANS CO	20	NOV-15
167	Osmania University	220/132	TSTRANSC O	160	NOV-15
168	Azamgarh -II (Aug.)	220/132	UPPTCL	100	NOV-15
169	Baraut (Aug.)	220/132	UPPTCL	40	NOV-15
170	Muradnagar (Aug.)	220/132	UPPTCL	100	NOV-15
171	Thimmapuram S/S	220/132	APTRANSC O	100	DEC-15
172	Charadava S/S	220/66	GETCO	200	DEC-15
173	A-4, Faridabad S/s	220/66	HVPNL	200	DEC-15
174	Sampla (Aug.)	220/132	HVPNL	100	DEC-15
175	Arasikere S/S	220/110	KPTCL	200	DEC-15
176	DG Plant Yelahanka	220/66	KPTCL	300	DEC-15
177	Khanapur S/S	220/33	MSETCL	100	DEC-15
178	Nandgaon Peth S/S	220/33	MSETCL	100	DEC-15
179	Phulambri S/S	220/132	MSETCL	100	DEC-15
180	Sayne (Addl.) S/S	220/33	MSETCL	25	DEC-15
181	Tembhurni (Addl.)	220/33	MSETCL	50	DEC-15
182	Bassi Pathana (Aug.) (2nd Addl.)	220/66	PSTCL	100	DEC-15
183	Behror S/S	220/132	RVPNL	160	DEC-15
184	Kuchera S/S	220/132	RVPNL	160	DEC-15
185	Thingalur S/S	230/110	TANTRANS CO	200	DEC-15
186	Chatta (New) (2x160+2x40)	220/132	UPPTCL	400	DEC-15
187	Firozabad (Aug) (160-60)	220/132	UPPTCL	60	DEC-15
188	Harhua (New) (60) S/S	220/33	UPPTCL	60	DEC-15
189	Loni (Aug) (200-150)	220/132	UPPTCL	50	DEC-15
190	Mainpuri (Aug.II) (160-100)	220/132	UPPTCL	50	DEC-15

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
191	Sarojini Nagar (Aug.) (200-100)	220/132	UPPTCL	100	DEC-15
192	Sonabil (2x100)	220/132	AEGCL	200	JAN-16
193	Hinganghat S/S	220/33	MSETCL	50	JAN-16
194	GHTP Lehra Mohabbaton (Aug.) (160-100)	220/66	PSTCL	60	JAN-16
195	Omega S/S	230/110	TANTRANS CO	100	JAN-16
196	Ulundurpet S/S	230/110	TANTRANS CO	100	JAN-16
197	Lalitpur (Aug.) (160-100)	220/132	UPPTCL	60	JAN-16
198	Orai (Aug.) -II (160-100)	220/132	UPPTCL	60	JAN-16
199	Sambhal (Aug.) III (100)	220/132	UPPTCL	100	JAN-16
200	Dharampur S/S	220/132	WBSETCL	320	JAN-16
201	Pattiseema S/S	220/11	APTRANSC O	60	FEB-16
202	Rachagunneri S/S (in Chitoor distt.)	220/132	APTRANSC O	100	FEB-16
203	Wazirpur (GIS)	220/33	DTL	200	FEB-16
204	Atri (Karadagadia) 1st ICT S/S	220/132	OPTCL	160	FEB-16
205	Chonkarwada S/S (Bharatpur Distt.)	220/132	RVPNL	160	FEB-16
206	NPH (Jaipur) (GSS) (AUG.)	220/132	RVPNL	160	FEB-16
207	Ramgarh (GSS) (AUG)	220/132	RVPNL	160	FEB-16
208	Gurubarapally S/S	230/110	TANTRANS CO	100	FEB-16
209	Vyasarpadi	230/110	TANTRANS CO	200	FEB-16
210	Boko (Add.Trf)	220/132	AEGCL	100	MAR-16
211	Tinsukia (Aug.) (2x50 by 2x100)	220/132	AEGCL	100	MAR-16
212	Gangavaram port	220/33	APTRANSC O	100	MAR-16
213	Sonenagar S/S	220/132/33	BSEB	100	MAR-16
214	Girwani S/S	220/132	CSPTCL	160	MAR-16
215	Charanka S/S	220/66	GETCO	200	MAR-16
216	Dhangadhra ICT-II	220/66	GETCO	60	MAR-16
217	Dhansura S/S	220/66	GETCO	50	MAR-16
218	Hadala ICT-II	220/66	GETCO	110	MAR-16

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
219	Jamnagar S/S	220/132	GETCO	50	MAR-16
220	Kheralu S/S	220/66	GETCO	160	MAR-16
221	Lalpar S/S	220/66	GETCO	60	MAR-16
222	Moti Paneli S/S	220/66	GETCO	50	MAR-16
223	Navsari S/S	220/66	GETCO	50	MAR-16
224	Palanpur S/S	220/66	GETCO	160	MAR-16
225	Ranasan S/S	220/132	GETCO	50	MAR-16
226	Sagapara S/S	220/66	GETCO	50	MAR-16
227	Sardargadh S/S	220/66	GETCO	50	MAR-16
228	Tharad S/S	220/66	GETCO	100	MAR-16
229	Vallabhipur S/S (Upgradation from 132 kV)	220/132	GETCO	200	MAR-16
230	Vapi (Addl.) S/S	220/66	GETCO	60	MAR-16
231	Veloda (Sankhari) S/S	220/66	GETCO	320	MAR-16
232	Waghodia S/S	220/66	GETCO	50	MAR-16
233	Chaibasa	220/132	JSEB	300	MAR-16
234	Ashoknagar S/S (upgradation)	220/132	MPPTCL	160	MAR-16
235	Shivpuri (addl) S/S	220/132	MPPTCL	160	MAR-16
236	Akurdi (3x50)	220/22	MSETCL	150	MAR-16
237	Bhalwani S/S	220/33	MSETCL	50	MAR-16
238	Bhokar S/S (addl.)	220/132/33	MSETCL	200	MAR-16
239	Bridestone (addl.)	220/33	MSETCL	50	MAR-16
240	Chakan-II	220/132	MSETCL	200	MAR-16
241	Gadchandur (50-25)	220/33	MSETCL	25	MAR-16
242	Kondhwa S/S	220/22	MSETCL	100	MAR-16
243	MIDC Lonand S/S	220/132/33	MSETCL	150	MAR-16
244	Magarpatta S/S (ICT-I)	220/132	MSETCL	100	MAR-16
245	Mahape (addl.)	220/22	MSETCL	50	MAR-16
246	Manjarsumbha S/S	220/33	MSETCL	25	MAR-16

Sl. No.	Name of Sub-Station	Voltage Ratio (kV/kV)	Executing Agency	Capacity (MW/MVA)	Month of Completion
247	Pal Dombivali S/S	220/22	MSETCL	100	MAR-16
248	Walchandnagar	220/132	MSETCL	200	MAR-16
249	Nangalbibra S/S (at Agia in Assam for Meghalaya)	220/132	MeECL	100	MAR-16
250	Naraingarh S/S (Upgraded from 132 kV)	220/66	PSTCL	160	MAR-16
251	Badnu (2nd ICT addl.)	220/132	RVPNL	160	MAR-16
252	Barli (Distt. Jodhpur) S/S	220/132	RVPNL	160	MAR-16
253	Danta Ramgarh	220/132	RVPNL	160	MAR-16
254	Jethana S/S	220/132	RVPNL	160	MAR-16
255	Niawana S/S	220/132	RVPNL	160	MAR-16
256	Phalodi (2nd ICT addl.)	220/132	RVPNL	160	MAR-16
257	Alandur (Addl.) S/S	230/33	TANTRANS CO	200	MAR-16
258	Anuppankulam (3rd auto transformer)	230/110	TANTRANS CO	100	MAR-16
259	Guindy (3rd auto tx.)	230/110	TANTRANS CO	100	MAR-16
260	Karuvalur (JICA) S/S	230/110	TANTRANS CO	200	MAR-16
261	Manthani S/S	220/132	TSTRANSC O	200	MAR-16
262	Salivagu Lift Irrigation	220/11	TSTRANSC O	63	MAR-16
263	Boner, Aligarh (New)	220/132	UPPTCL	160	MAR-16
264	Dadri (Aug)(160-100)	220/132	UPPTCL	60	MAR-16
265	Firozabad (Aug.)	220/132	UPPTCL	50	MAR-16
266	Gajraula (Aug.)	220/132	UPPTCL	60	MAR-16
267	Noida Sector - 129 (Aug.)	220/132	UPPTCL	160	MAR-16
268	Sikandara (Agra) (Aug) (2x60-1x60)	220/33	UPPTCL	60	MAR-16
269	moradabad (Aug.) (160-100)	220/132	UPPTCL	60	MAR-16
Total of STATE Sector				23934	
Toatl of 220 kV				24804	

Annexure-6.5 (A)

Lines expected to commission in 2016-17

Sl. No.	Name of Sub-Station	Capacity (cKM)	Month of Completion
1	**North East / Northern Western Interconnector -I Project**	**5103**	**Dec'16 ***
1.1	400KV D/C Kameng - Balipara line	114	Dec'16
2	**WR - NR HVDC Interconnector for IPP Projects in Chattisgarh**	**3134**	**Jun'16**
2.1	+/- 800KV HVDC Bipole between Champa Pooling Station - Kurukshetra line (with provision to upgrade HVDC terminal to 6000MW at later date) *	2573	Jun'16*
3	**Common System Associated with East Coast Energy Pvt. Ltd and NCC Power Projects Ltd. LTOA Gen. Proj. in Srikakulam -Part-A**	**552**	**Aug'16**
3.1	765KV D/C Srikakulam Pooling Station - Angul line *	552	Aug'16
4	**Common System Associated with East Coast Energy Pvt. Ltd and NCC Power Projects Ltd. LTOA Gen. Proj. in Srikakulam area - Part - B**	**810**	**Dec'16**
4.1	765KV D/C Angul - Jharsauguda line	580	Dec'16
4.2	765 KV D/C Jharsuguda - Dharamjaygarh line	230	Aug'16
5	**Northern Region System Strengthening Scheme - XVIII**	**330**	**Jun'16**
5.1	400KV D/C Dehradun - Bagpat line (Q)	330	Jun'16
6	**Northern Regional System Strengthening Scheme - XVI**	**287**	**Jun'16**
6.1	400KV D/C Kishenpur - New Wanpoh line.	278	Jun'16
7	**Northern Regional System Strengthening Scheme - XXIV**	**293**	**Jun'16**
7.1	400KV D/C Dehradun-Abdullapur line (Q)	178	Jun'16
7.2	400KV D/C Dulhasti - Kishenpur line (Quad) Single ckt strung.	115	Jun'16
8	**Transmission System for Phase-I Generation Projects in Jharkhand and West Bengal - Part - B.**	**1396**	**Jun'16**
8.1	765KV S/C Kanpur - Jhatikara line	466	Jun'16
9	**Trans. System Associated with Meja TPS.**	**56**	**Jun'16**
9.1	400KV D/C Meja - Allahabad line	56	Jun'16

Sl. No.	Name of Sub-Station	Capacity (cKM)	Month of Completion
10	**Transmission System Associated with RAPP 7 & 8 - Part-A.**	**90**	**Dec'16**
10.1	400KV D/C RAPP - Kota line	90	Dec'16
11	**Northern Region System Strengthening Scheme -XXX**	**656**	**Jun'16**
11.1	400KV S/C Singrauli - Allahabad line (section of Singrauli-Allahabad line (50 Km) to be strung on existing 400KV D/C tower from Singrauli end)	170	Jun'16
11.2	400KV D/C Allahabad - Kanpur line	486	Jun'16
12	**Northern Region System Strengthening Scheme -XXXII**	**549**	**Jun'16**
12.1	400KV D/C Panchkula - Patiala line (10 Km Multi-ckt towers in forest area near Panchkula)	131	Jun'16
12.2	400KV D/C Lucknow - Kanpur line	320	Jun'16
12.3	LILO of 400KV D/C Dadri - Malerkotla line at Kaithal	50	Jun'16
12.4	LILO of both ckt of 400KV D/C RAPP - Kankroli line at Chittorgarh (RRVPNL). (15Km Multi-ckt & 3 Km D/C)	48	Jun'16
13	**Western Region Strengthening Scheme - V**	**308**	**Jun'16**
13.1	400KV Vapi (PG) - Kala - Kudus D/C line*	236	Jun'16
14	**Transmission System Associated with Mundra Ultra Mega Power Proj.**	**3644**	**Dec'16**
14.1	400KV D/C Navsari - Boisor line	380	Jun'16
14.2	400KV D/C Wardha - Aurangabad line (up-gradation 1200KV S/C)	694	Dec'16
15	**Transmission System strengthening in Western part of WR for IPP Generation Projects in Chhatisgsrh - part-D**	**1344**	**Jun'16**
15.1	400KV D/C Aurangabad - Boisar line (Quad)	654	Jun'16
16	**System Strengthening in North/West part of WR for IPP Proj. in Chhattisgarh. Part - E**	**628**	**Jun'16**
16.1	765KV D/C Aurangabad (PG) - Padghe (PG) line	570	Jun'16
16.2	400KV D/C Padghe (PG) - Kudus line (Q)	34	Jun'16
17	**System Strengthening in Raipur - Wardha Corridor for IPP Project in Chhattisgarh - Part - 6**	**714**	**Jun'16**
17.1	765KV D/C Raipur Pooling Stn. - Wardha line -II	714	Jun'16
18	**Transmission System Associated with Mauda Stage-II (2x660MW) Gen. Proj.**	**1068**	**May'16**

Sl. No.	Name of Sub-Station	Capacity (cKM)	Month of Completion
18.1	400KV D/C Mauda-II - Betul line (Quad)	386	May'16
18.2	400KV D/C Betul - Khandwa line (Quad)	338	May'16
18.3	400KV D/C Khandwa - Indore line	344	May'16
19	**Transmission System Associated with KAKRAPAR APP - 3&4**	**308**	**Oct'16**
19.1	400KV D/C Kakrapar APP - Navsari line	76	Oct'16
19.2	400KV D/C Kakrapar APP - Vapi line	232	Oct'16
20	**Common System Associated with Costal Energen Private Ltd and Ind-Barath Power Ltd. (LTOA) Gen. Proj. in Tuticorin area Part - B.**	**1103**	**Jun'16**
20.1	765KV D/C Tuticorin Pooling Station - Salem Pooling Station line (initialy charged at 400KV)	739	Jun'16
21	**Transmission System for Development of Pooling Station in Northern region Part of West Bengal and Transfer of Power from BHUTAN to NR/WR.**	**165**	**Dec'16**
21.1	400KV D/C Punatsangchu-1 (Gen. Proj. in Bhutan) - Alipurduar line (HTLS Cond.) India Portion.	128	Dec'16
22	**Eastern Region Strengthening Scheme - III**	**716**	**Dec'16**
22.1	400KV D/C Sasaram - Deltonganj line	392	Dec'16
23	**Eastern Region Strengthening Scheme-V**	**961**	**Apr'16**
23.1	400KV D/C Rajarhat - Purnea line (Tripal) (with LILO of one ckt at Gokarana (WBSETCL) & other ckt at Farraka (NTPC).	953	Apr'16
23.2	LILO of Subhashgram -Jeerat 400KV S/C line at Rajarhat	8	Apr'16
24	**Eastern Region Strengthening Scheme - XIII**	**86**	**Nov'16**
24.1	Re- conductoring of 400KV D/C Farakka-Malda line (HTLS Cond.) with associated bays.	86	Nov'16
25	**Trans. System associated with Pallatana gas Based Power Project and Bongaigaon Thermal Power Station (BTPS)**	**1444**	**Jun'16**
25.1	400KV D/C Silchar - Melriat (New) line (charged at 132KV)	286	Jun'16
25.2	132KV D/C Melriat (New) - Sihmui line	12	Jun'16
25.3	LILO of 01 ckt at 132KV Aizwol (PG) - Zemabawk (Mizoram) at Melriat (PG)	30	Jun'16
25.4	132KV S/C Tezu - Namsai line (on D/C)	96	Jun'16
TBCB lines			

Sl. No.	Name of Sub-Station	Capacity (cKM)	Month of Completion
26	**System Strengthening in Southern Region for Import of Power from Eastern Region**	0	**Aug'16**
26.1	765KV D/C Srikakulam PP -Vemagiri-II PS	668	Aug'16
27	**Associated Transmission System of Unchahar TPS.**	0	**Jun'16**
27.2	400KV D/C Unchahar - Fatehpur Line	106	Jun'16
28	**Leh Transmission System**	0	**Jan'17**
28.1	220KV S/C Alusteng - Drass - Kargil - Khalsti - Leh Trans. Line	334	Jan'17

Annexure-6.5 (B)

Substations expected to be completed in 2016-17

Sl. No.	Name of Sub-Station	Capacity (MW/MVA)	Month of Completion
1	**North East / Northern Western Interconnector - I Project**		**Dec'16**
1.1	Extn. of 400KV Balipara S/Stn.		Dec'16
2	**WR - NR HVDC Interconnector for IPP Projects in Chattisgarh**		**Jun'16**
2.1	HVDC Rectifier Module of 3000MW capacity at Champa		Jun'16
2.2	HVDC Rectifier Module of 3000MW capacity at Kurukshetra		Jun'16
3	**Common System Associated with East Coast Energy Pvt. Ltd and NCC Power Projects Ltd. LTOA Gen. Proj. in Srikakulam area-Part-B**		**Dec'16**
3.1	Extn. of 765/400KV Angul S/stn.		Dec'16
3.2	Extn. of 765/400KV Jharsuguda S/stn.		Dec'16
3.3	Extn. of 765/400KV Dharamjaigarh S/s.		Aug'16
4	**Common System Associated with East Coast Energy Pvt. Ltd and NCC Power Proj. Ltd. LTOA Gen. Proj. in Srikakulam area - Part-C**		**Aug'16**
4.1	Srikakulam Pooling Stn. & 02 nos 765KV bays **(400KV S/S - AIS & 765KV S/S- GIS)**	2x1500	Aug'16
4.2	Extn. of 765/400KV Angul S/stn.		Aug'16
5	**Northern Region System Strengthening Scheme - XVIII**		**Jun'16**
5.1	400/220KV Dehradun Sub station	2x315	Jun'16
5.2	Extn. 400/220KV Bagpat GIS		Jun'16
6	**Northern Regional System Strengthening Scheme - XVI**		**Jun'16**
6.1	Extn. of 400/220KV Kishanpur Substation	-	Jun'16
7	**Northern Regional System Strengthening Scheme - XXIV**		**Jun'16**
7.1	Extn. at 400/220 KV Deharadun, Abdullapur and Kishenpur Sub station,		Jun'16
8	**Transmission System Associated with Meja TPS.**		**Jun'16**
8.1	Extn. at 400/220KV Allahabad S/Stn. (Extn. at Meja developed by Gen. Agency)		Jun'16
9	**Transmission System Associated with RAPP 7 & 8 - Part-A.**		**Dec'16**
9.1	Extn. at 400KV Kota S/stn.		Dec'16

Sl. No.	Name of Sub-Station	Capacity (MW/MVA)	Month of Completion
10	**Northern Region System Strengthening Scheme -XXX**		**Jun'16**
10.1	Extn. at 400KV Singrauli S/stn. at NTPC Gen. Stn.		Jun'16
10.2	Extn. at 400/220KV Allahabad S/Stn.		Jun'16
10.3	Extn. at 765/400KV Kanpur GIS		Jun'16
11	**Northern Region System Strengthening Scheme -XXXII**		**Jun'16**
11.1	Aug. at 400/220KV Ballabhgarh S/stn. (replacing existing 4x315MVA with 4x500MVA ICT's)	740	Jun'16
11.2	Aug. at 400/220KV Mandola S/stn. (replacing existing 4x315MVA with 4x500MVA ICT's)	740	Jun'16
11.3	Provision of 7x105 MVA 400/220KV ICT at Parbati PS	630	Jun'16
11.4	Aug. at 400/220KV Gurgaon S/stn. (4th ICT-500MVA)	500	Jun'16
11.5	Extn. at 400/220KV Panchkula & Patiala S/stn.	-	Jun'16
11.6	Extn. at 765/400/220KV Lucknow & KanpurS/stn.	-	Jun'16
11.7	Extn at 400/220KV Chittorgarh & Kaithal S/stn.	-	Jun'16
12	**Static VAR Compensators (SVCs) in Northern Region**		**Aug'16**
12.1	SVC at 400/220KV Ludhiana S/stn. (+)600MVAR / (-) 400MVAR	-	Aug'16
12.2	SVC at 400/220KV Kankroli S/stn. (+)400MVAR / (-) 300MVAR	-	Aug'16
12.3	SVC at 400/220KV New Wanpoh S/stn. (+)300MVAR / (-) 200MVAR	-	Aug'16
13	**Provision of 400KV Bays for line under Northern Region System Strengthening Scheme - XXXI**		**Sep'16**
13.1	Extn at Kurukshetra HVDC S/sn (GIS)		Sep'16
13.2	Extn at 400/220KV Malerkotla Sub station (GIS)		Sep'16
13.3	Extn at 400/220KV Amritsar Sub station		Sep'16
14	**Transmission System Associated with Mundra Ultra Mega Power Proj.**		**Dec'16**
14.1	Extn. 400KV at Boisar S/Stn.		Jun'16
14.2	400/220 KV Aurangabad S/Stn. & Extn. at 400KV Wardha & Aurangabad (MSETCL) S/stn.	2x315	Dec'16
15	**Establishment of Pooling Station at Champa and Raigarh (near Tamnar) for IPP Gen. Proj. in Chhatisgsrh -B**		**Jun'16**
15.1	765/400 KV Champa Pooling Station	6x1500	Jun'16

Sl. No.	Name of Sub-Station	Capacity (MW/MVA)	Month of Completion
16	**Transmission System strengthening in Western part of WR for IPP Generation Projects in Chhatisgsrh - part-D**		**Jun'16**
16.1	765/400KV Padghe S/Stn. GIS	2x1500	Jun'16
16.2	Extn. at 765/400KV Aurangabad		Jun'16
16.3	Extn. at 400KV Padghe S/S. (MSETCL)		Jun'16
17	**Transmission System for connectivity of Essar Power Gujarat Limited.**		**Dec'15**
17.1	Extn. 400KV Bachau Sub station	-	Dec'15
18	**System Strengthening in Raipur - Wardha Corridor fo IPP Project in Chhattisgarh-Part-6**		**Jun'16**
18.1	Extn. of 765KV Raipur Pooling station	-	Jun'16
18.2	Extn. of 765KV Wardha Sub station	-	Jun'16
19	**Installation of Transformer & Procurement of Spare Converter Transformer at Bhadrawati HVDC B/B Stn.**		**Sep'16**
19.1	Procurement of Spare Converter Tfrs - 234MVA, 1-Ph 3 Winding		Sep'16
20	**Transmission System Associated with Mauda Stage-II (2x660MW) Gen. Proj.**		**May'16**
20.1	400/220KV Betul Sub station (GIS)	2x315	May'16
20.2	Extn. 400KV Indore & Khandwa S/stn.		May'16
21	**Transmission System Associated with KAKRAPAR APP - 3&4**		**Oct'16**
21.1	Extn. at 400/220KV Navsari GIS S/stn.		Oct'16
21.2	Extn. at 400/220 KV Vapi S/stn.		Oct'16
22	**Installation of Bus Reactor & ICT in Western Region**		**July'16**
22.1	Extn. at 765/400KV Raigarh S/stn. (Tamnar) ICT (1500MVA) with bays	1500	July'16
22.2	Extn. at 765/400KV Raipur PS. ICT (1500MVA) with bays	1500	July'16
22.3	Extn. at 400/220KV Vadodara GIS. ICT (2x500MVA) with 02 nos. bays 04 nos. 220KV line bays	2x500	July'16
22.4	Extn. at 400/220KV Damoh S/stn.. ICT (500MVA) with bays	500	July'16
22.5	Extn. at 400/220KV Rajgarh S/stn.. 63 MVAR Switchable line reactor		July'16
22.6	Extn. at 400/220KV Bina S/stn.. 125 MVAR Bus Reactor		July'16
23	**Common System Associated with Costal Energen Private Ltd and Ind-Barath Power Ltd. (LTOA) Gen. Proj. in Tuticorin area Part - B..**	-	**Jun'16**
23.1	765/400KV Salem Pooling station (initially charged at 400KV)		Jun'16
23.2	Extn. at 765/400KV Tuticorin Pooling Stn		Jun'16

Sl. No.	Name of Sub-Station	Capacity (MW/MVA)	Month of Completion
24	**System Strengthening in SR - XX**	**5870**	**Feb'17**
24.1	Extn. at 400/220/33KV Hyderabad Sub station	500	Feb'17
24.2	Extn. at 400/220/33KV Warangal Sub station	500	Feb'17
24.3	Extn. at 400/220/33KV Khammam Sub station	500	Feb'17
24.4	Extn. at 400/220/33KV Vijayawada Sub station	500	Feb'17
24.5	Extn. at 400/220/33KV Gooty Sub station	500	Feb'17
24.6	Extn. at 400/220/33KV Cuddapa Sub station	500	Feb'17
24.7	Extn. at 400/220/33KV Malekuttaiayur S/stn.	500	Feb'17
24.8	Extn. at 400/220/33KV Somanahalli S/stn.	500	Feb'17
24.9	Extn. at 400/220/33KV Mysore S/stn.	500	Feb'17
24.10	Extn. at 400/220/33KV Pugalur S/stn.	500	Feb'17
24.11	Extn. at 400/220/33KV Trichy S/stn.	500	Feb'17
24.12	Repl. Of existing 2x315 Tfr. To 2x500 MVA at 400/220KV Narendra S/stn.	370	Feb'17
24.13	Extn. at 400/220KV at Trissur S/stn. (Conversion line reactors)	-	Feb'17
25	**Transmission System for Ultra mega Solar Park in Anantpur District, Andhara Pradesh - Part-A (Phase-I)**		**May'16**
25.1	400/220KV NP Kunta Pooling Station (with 01 nos. 125 MVAR, Bus Reactor)	3x500	May'16
26	**Transmission System for Development of Pooling Station in Northern Region Part of West Bengal and Transfer of Power from BHUTAN to NR/WR.**		**Dec'16**
26.1	400/220KV HVAC & 3000MW +/-800KV HVDC New Pooling Station in Alipurduar	2x315	Mar'16
27	**Eastern Region Strengthening Scheme - III**		**Dec'16**
27.1	400/220 KV Daltonganj	2x315	Dec'16
28	**Eastern Region Strengthening Scheme-IX**		**Jun'16**
28.1	Installation of 125 MVAR Bus Reactor at Gazwaka (1 no.), Rengali (2 nos.), Maithon (1 no.), Biharshariff (1 no.), Jamshedpue (2 nos.), Rourkela (1 no.) and Durgapur (2 nos.) Converting 2x80 MVAR LR at Gorakhpur end of Barh-II - Gorakhpur 400KV D/C line to 2x80MVAR Switchable LR.		Jun'16
28.2	Repl. 2 nos. ICT's, 500MVA to 315 MVA at 400/220KV Maithon S/stn.	370	Jun'16
28.3	Procur. 500MVA ICT at 765/400KV Gaya S/stn.		Jun'16
29	**Eastern Region Strengthening Scheme-XII**	**2100**	**Nov'16**

Sl. No.	Name of Sub-Station	Capacity (MW/MVA)	Month of Completion
29.1	Installation of 125 MVAR Bus Reactor at Baripada (1 no.) & Maithon (1 no.) with GIS bays. Conversion of 50 MVAR LR, presently installed at Jeerat end of Baharampur - Jeerat 400KV line as BR in parallel with existing BR at Jeerat.		Nov'16
29.2	Addition of 500MVA ICT at 400/220KV Baripada S/stn.	500	Nov'16
29.3	Repl. 2 nos. ICT's, 315MVA to 500MVA at 400/220KV Purnea S/stn.	370	Nov'16
29.4	Repl. 2 nos. ICT's, 315MVA to 500MVA at 400/220KV Pusali S/stn.	370	Nov'16
29.5	Repl. 2 nos. ICT's, 315MVA to 500MVA at 400/220KV Patna S/stn.	370	Nov'16
29.6	Shifting 1 no. ICT, 315MVA to 500 MVA at 400/220KV Jamshedpur S/S.	185	Nov'16
29.7	Shifting 1 no. ICT, 315MVA to 500 MVA at 400/220KV Farakka S/S.	185	Nov'16
29.8	Repl. 1 no. ICT's, 100MVA to160MVA at 220/132KV Siliguri S/stn.	60	Nov'16
29.9	Repl. 1 no. ICT's, 100MVA to160MVA at 220/132KV Birpara S/stn.	60	Nov'16
29.10	Modification of 132KV Bus arrangement at 220/132 KV Siliguri & Purnea S/stn. with GIS bays.	-	Nov'16
29.11	Const. of 4 nos 220KV GIS line bays at Kishanganj S/stn.	-	Nov'16
30	**Eastern Region Strengthening Scheme - XIII**		**Nov'16**
30.1	Upgradation of Bays at Ferakka & Malda S/stn.		Nov'16
31	**Sub station extn. works associated with Eastern Region Strengthening Scheme -VII**		**Mar'17**
31.1	Extn at 400KV bays at 400/220KV Purulia PSPP Sw.Yd., Kharagpur, Chaibasa and 765/400KV Ranchi S/stn. (02 nos. each)		Mar'17
31.2	Extn at 765/400KV Ranchi S/stn. end (2x50 MVAR LR) and 400/220KV Chaibasa S/stn. end (2x63 MVAR LR)		Mar'17
32	**Transmission System associated with Pallatana gas Based Power Project and Bongaigaon Thermal Power Station (BTPS)**		**Mar'13 to Jun'16**
32.1	400/220KV Silchar S/Stn. (New)	2x200	Jun'16
32.2	132KV Melriat Switching Stn. (upgradable to 400KV)		Jun'16
32.3	132/33 KV Namsai S/Stn.	7x5	Jun'16

Sl. No.	Name of Sub-Station	Capacity (MW/MVA)	Month of Completion
32.4	Bay extension at 400 KV Bongaigaon & Purba Kanchan Bari, 132 KV Badarpur (PG), 132 KV Melriat , 132 KV Mokochung (Nagaland), 132KV Ziro (PG) and 132KV Pasighat (Govt. of Arunachal),Hailakandi & Sirkona (AEGCL) Substations.		April'12 to Jun'16

Annexure-6.6

Challenges

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
1.0	**MULTI REGIONAL SYSTEMS**	
1.1	**North East / Northern Western Interconnector -I Project**	**Lower Subhansari HEP (Gen. Project delayed).**
1.1.1	**Part-A : North East - Northern/ Western Interconnector -I**	
1.1.1.1	**+/- 800KV HVDC Biswanath Chariyali - Agra Bi-pole line ***	Line completed & Commissioned in Oct'15
1.1.1.2	400KV Balipara - Biswanath Chariyali line	Line test charged in Sep'15 & commissioned on 01.10.15.
1.1.1.3	LILO of Ranganadi - Balipara 400KV D/C line at Biswanath Chariyali (Pooling Point)	Line commissioned on 30.10.15.
1.1.1.4	132KV D/C Biswanath Chariyali - Biswanath Chariyali (AEGCL) line	Line test charged in Sep'15 & commissioned on 01.10.15.
1.1.2	**Part-B : Transmission System for immediate evacuation of Power from Kameng HEP**	Generation expected in 2016-17.
1.1.2.1	400KV D/C Kameng - Balipara line	ATS slowed-down to the extent possible to match Generation.
1.1.2.2	400KV D/C Balipara - Bongaigaon line (Quad)	Line ready for commissioing in Oct'14 & commissioned on 02.11.14.
1.1.3	**Part-C : Transmission System for immediate evacuation of Power from Lower Subhansiri HEP**	Generation Project delayed.
1.1.3.1	400KV D/C Lower Subhansiri - Biswanath Chariyali line -I	Works stand-still on a/c of local disturbance/ agitation against big dams. Gen. sch. uncertain.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
1.1.3.2	400KV D/C Lower Subhansiri - Biswanath Chariyali line -II	Works stand-still on a/c of local disturbance/ agitation against big dams. Gen. sch. uncertain.
1.2	**Transmission System of Vindhyachal-IV and Rihand -III (1000MW each) Gen. Proj.**	
1.2.1	765KV D/C Rihand - Vindhyachal Pooling station line	Ckt-I charged at 400KV on 26.06.14. Ckt-II ready for commissiong in Aug'15.
1.2.2	400KV D/C Vindhyachal-IV - Vindhyachal Pooling Station line (Q)	Test charged on 30.12.12 by passing Vindhyachal Pooling stn. under contigency and commissioned in Jan'13.
1.2.3	765KV S/C Vindhyachal Pooling Station - Satna line (193 KmS/C+78CKm D/C Portion) (Ckt-I)	Line commissioned in Mar'15
1.2.4	765KV S/C Vindhyachal Pooling Station - Satna line (194 KmS/C+77CKm D/C Portion) Ckt-II	Line commissioned in Aug;15.
1.2.5	765KV S/C Satna - Gwalior line (Ckt-I) (including comman D/C Locs.)	Line commissioned in Feb'14.
1.2.6	765KV S/C Satna - Gwalior line Ckt-II	Line commissioned in Aug'14
1.2.7	765KV S/C Sasan - Vindhyachal Pooling Station line	Line commissioned in April'15.
1.2.8	400KV D/C Sasan - Vindhyachal Pooling Station line	Line commissioned in Dec'12.
1.2.9	**765KV S/C Gwalior - Jaipur (RVPN) line * (Incl. common D/C portion locs.)**	Line commissioned in Aug'15.
1.2.10	400KV D/C Bassi -Jaipur (RVPN) line (Q)	Line commissioned in Dec'13.
1.3	**Transmission System for Phase-I Gen. Projects in ORISSA - Part - B.**	**BPTA Schedule Jul'14.**
1.3.1	765 KV D/C Jharsuguda Pooling Station - Dharamjaygarh line *	Line commissioned in Jul'14.
1.3.2	765 KV D/C Dharamjaygarh - Jabalpur Pooling Station line	Line commissioned on 15.10.15
1.3.3	LILO of 765KV S/C Ranchi - Sipat (Bilaspur) Pooling Station at Dharamjaygarh / near Korba	Line commissioned in Mar'14
1.3.4	400 KV D/C Jabalpur Pooling Station - Jabalpur (High Capacity) line	Line commissioned in Dec'13.
1.4	**Transmission System for Phase-I Gen. Projects in ORISSA- Part- C.**	*** BPTA Schedule.**
1.4.1	765 KV D/C Jabalpur Pooling Station - Bina line	Line commissioned in Dec'13.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
1.4.2	765 KV S/C Bina - Gwalior line (3rd Ckt)	Line commissioned in May'14.
1.4.3	**765KV S/C Gwalior-Jaipur line (2nd Ckt) * (excl. common D/C portion locs. (195)**	Line commissioned in Aug'15.
1.4.4	765 KV S/C Jaipur - Bhiwani line	Line commissioned in Aug'15.
1.5	**Immediate evacuation system with BARH - II TPS**	**# Revised schedule.**
1.5.1	**400 KV D/C Barh - II TPS - Gorakhpur line (Quad) ***	**Line ready for commissioning in May'15 & commissioned in Jun'15**
1.6	**Transmission System for Phase-I Generation Projects in Jharkhand and West Bengal - Part - A2.**	**BPTA Schedule Sep'14.**
1.6.1	**765KV S/C Ranchi New(765/400KV S/S) - Dharamjaygarh / Near Korba line ***	Line commissioned in Dec'15.
1.6.2	**765KV S/C Gaya - Varanasi line ***	Testing under progress.
1.6.3	765KV S/C Balia - Varanasi line	Line commissioned in Mar'16.
1.7	**Transmission System Associated with KRISHNAPATNAM UMPP - Part - B.**	
1.7.1	**765KV S/C Raichur - Sholapur line ***	**Line commissioned in Dec'13.**
1.7.2	765KV S/C Sholapur - Pune line	Line commissioned in Feb'15.
1.7.3	LILO of 400KV D/C Parli - Pune line at Pune (GIS) (including Multi - Ckt)	LILO line commissioned in Feb'15.
1.7.4	LILO of 400KV D/C Pune - Aurangabad line at Pune (GIS) (including Multi - Ckt)	ROW problem being resolved progressively.
1.7.5	LILO of 400KV D/C existing Raichur - Gooty at Raichur (new) S/Stn. (Quad)	Line commissioned in Dec'13.
1.8	**WR - NR HVDC Interconnector for IPP Projects in Chattisgarh**	**BPTA Schedule Dec'15.**
	PART-A: WR-NR Interconnector for IPP Projects in Chattisgarh	
1.8.1	**+/- 800KV HVDC Bipole between Champa Pooling Station - Kurukshetra line (with provision to upgrade HVDC terminal to 6000MW at later date) ***	*** Completion matching with HVDC Champa Station. Also ROW problem being faced in Shamli area of U.P.**
	PART-B: Trans. System Strenthening in NR for IPP Proj. in Chittasgarh	
1.8.2	400KV D/C Kurukshetra - Jallandhar line (Quad) (one ckt vis 400/220KV Nakodar (PSTCL) S/Stn.)	Line ready for commissioning in Nov'15 & commissioned in Dec'15.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
1.8.3	LILO of Abdullapur - Sonepat 400KV D/C at Kurukshetra (Tripal)	Line ready for commissioning in Nov'15 & commissioned in Dec'15.
1.9	**Common System Associated with East Coast Energy Pvt. Ltd and NCC Power Projects Ltd. LTOA Gen. Proj. in Srikakulam -Part-A**	**Gen. Project delayed.**
1.9.1	**765KV D/C Srikakulam Pooling Station - Angul line ***	Stage-I forest clearance awaited (99 Ha.). 01 package re-tendered & awarded in Jun'15. Completion matching with Srikakulam-Vemagiri being executed under TBCB rout (Sch. Aug'16). Efforts being made to complete earlier.
1.10	**System Strengthening - XVII in Southern Regional Grid**	
1.10.1	**765KV D/C Narendra (New Kudgi) - Kolhapur line (initialy charged at 400KV)***	**Ckt-I commissioned in Nov'15 & Ckt-II in Dec'15.**
1.10.2	400KV D/C Narendra (New Kudgi) - Narendra (extsting) line (Quad)	Line commissioned in Dec'15.
1.10.3	LILO of both ckt at 400KV D/C Kolhapur - Mapusa line at Kolhapur	Line commissioned in Nov'15.
1.11	**Common System Associated with East Coast Energy Pvt. Ltd and NCC Power Projects Ltd. LTOA Gen. Proj. in Srikakulam area - Part - B**	
1.11.1	765KV D/C Angul - Jharsauguda line	ROW being faced near Angul end. Huge forest involvement clearance awaited. Critical
1.11.2	765 KV D/C Jharsuguda - Dharamjaygarh line	Huge forest involvement. Critical
1.12	**Trans. Syatem Strengthening in WR - NR Tran. Corridor for IPP's in Chaittisgarh**	
1.12.1	400KV D/C Kurukshetra - Jind line (Q)	
1.13	**Inter-Regional System Strengthening Scheme in WR and NR (Part-B)**	
1.13.1	765KV D/C Jabalpur Pooling Stn. - Orai line	
1.13.2	765KV D/C Orai - Aligarh line	
1.13.3	400KV D/C Orai - Orai line (Q)	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
1.13.4	LILO of one ckt of Satna-Gwalior 765KV 2x S/C line at Orai	
1.13.5	LILO of Agra - Meerut 765KV S/C at Aligarh	Award placed in Mar'15. Engg. & survey under progress.
1.13.6	LILO of Kanpur - Jhatikara 765KV S/C at Aligarh	Award placed in Mar'15. Engg. & survey under progress.
1.14	**Wardha - Hyderabad 765 KV Links**	
1.14.1	765KV D/C Wardha - Hyderabad line	Efforts being made to complete Wardha-Nizamabad portion in FY 2016-17.
1.14.2	400KV D/C Nizamabad - Dichpali line	Efforts being made to complete in FY 2016-17.
1.15	**GREEN ENERGY CORRIDORS:- Inter State Transmission Scheme (ISTS) - Part - A**	
1.15.1	400KV D/C Ajmer (New) - Ajmer (RVPN) line (Q)	
1.15.2	400KV D/C Chittorgarh (NEW) - Chittorgarh (RVPN) line (Q)	
1.15.3	400KV D/C Tirunelveli PS-Tuticorin PS line-1 (Q)	
1.15.4	400KV D/C Tirunelveli PS-Tuticorin PS line-2 (Q)	Engg. & survey under progress.
1.16	**GREEN ENERGY CORRIDORS:- Inter State Transmission Scheme (ISTS) - Part - B**	
1.16.1	765KV D/C Banaskanta - Chittorgarh line	
1.16.2	765KV D/C Chittorgarh - Ajmer line	Work under progress.
1.16.3	400KV D/C Banaskanta - Sankhari line	Award placed in Jul'15. Engg. in progress.
1.17	**Transmission System Strengthening in Indian System for Transfer of Power from Mangdechhu Hydroelectric Proj, in BHUTAN.**	**Compln Sch. : 22 months from IA.**
1.17.1	400KV D/C Jagmeling - Alipurduar line (Q) (india Side)	Award placed in Mar'16.
2.0	**NORTHERN REGION**	
2.1	**Northern Region System Strengthening Scheme - XVIII**	
2.1.1	400KV D/C Dehradun - Bagpat line (Q)	ROW problem in western UP.
2.2	**Northern Region System Strengthening Scheme - XIX**	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
2.2.1	LILO of 400KV D/C Meerut - Kaithal line at Bagpat (Quad)	Ckt-I charged alongwith ICT-I in Mar'16. Balance expected by Apr'16.
2.3	**System Strengthening in Northern Region for SASAN & MUNDRA (UMPP)**	
2.3.1	400KV D/C Agra - Sikar line (Q)	Line commissioned in Dec'13.
2.3.2	400KV D/C Sikar - Jaipur line	ROW problem faced. Contract revived through assignemet to JV partner.
2.3.3	400KV D/C Sikar - Ratnagarh line	Line commissioned in Jan'15.
2.3.4	LILO of both ckt of Nathpa Jhakri - Abdullapur 400KV D/C (Tripal Snowbird) at Panchkula	Commissioned in Feb'12.
2.3.5	LILO of both ckt of Sikar (RVPN) - Ratnagarh 220KV D/C at Sikar	LILO of Ckt-I (6 Ckm) commissioned in Jan'12 & IInd ckt in April'12.
2.4	**Northern Regional Transmission Strengthening Scheme**	* Except LILO at Saharanpur (being planned to be dropped).
2.4.1	400KV D/C Bhiwani - Jind line	Line commissioned in Mar'13.
2.4.2	LILO of both ckt of 400KV D/C Balia - Lucknow line at Sohawal	LILO of ckt-II (12Ckm) commissioned in Jun'12. & Ckt-I in Jan'13.
2.4.3	LILO of both ckt of 400KV D/C Dehradun - Bagpat line (QUAD) at Saharanpur	Severe ROW problem in western UP. Line proposeed for deletion as advised by State Govt. (referred to CEA).
2.4.4	LILO of both ckt of 400KV D/C Lucknow - Bareliiy line (PG) at Shahjahanpur	LILO of Ckt-I (32 Ckm) commissioned in Feb'12 by-passing Sahajanpur S/s for providing connectivity for evacuation of Power from ROSA power. Ckt-II charged in Jun'14.
2.4.5	LILO of both ckt of 400KV D/C Agra - Jaipur line at Jaipur	LILO of 01 ckt commissioned in May'12 & Ckt-II in Aug'12.
2.5	**Northern Regional System Strengthening Scheme - XVI**	
2.5.1	LILO of both ckt of Kishenpur - Wagoora 400KV D/C line at Wanpoh	Line commissioned in Sep'13
2.5.2	400KV D/C Kishenpur - New Wanpoh line.	Limited working period due to snow-bound area & floods affecting implementation. Critical

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
2.6	**Northern Regional System Strengthening Scheme - XXI**	
2.6.1	765KV S/C Lucknow - Bareilly line	Line commissioned in Mar'14 (Through contigency arrangement)
2.6.2	400KV D/C Bareilly (New) - Bareilly (Exist) line (Quad)	Ckt-I&II commissioned in Mar'14/Mar'15.
2.6.3	400KV D/C Bareilly - Kashipur line (Quad)	Line commissioned on Apr'15.
2.6.4	400KV D/C Kashipur - Roorkee line (Quad)	Line commissioned in Dec'15.
2.6.5	400KV D/C Roorkee - Saharanpur line (Quad)	ROW problem in western UP. 02 nos. locations hold up. Critical.
2.7	**Northern Regional System Strengthening Scheme - XXIV**	
2.7.1	400KV D/C Dehradun-Abdullapur line (Q)	Severe ROW problem in Uttrakhand.
2.7.2	400KV D/C Dulhasti - Kishenpur line (Q) Single ckt strung.	ROW being encountered.
2.8	**Transmission System for Phase-I Generation Projects in Jharkhand and West Bengal - Part - B.**	BPTA Schedule in Nov'14. Gen. project delayed (ant. in 2016-17 & beyond).
2.8.1	765KV D/C Varanasi - Kanpur line	Completion matching with Varanasi S/S. Balance land for Varanasi GIS acquired on 30.06.14.
2.8.2	765KV S/C Kanpur - Jhatikara line	Matching with Kanpur 765KV GIS. Permission to work obtained in Jan'16.
2.8.3	400KV D/C Kanpur (new) - Kanpur (Exit.) line (Q)	Matching with Kanpur 765KV GIS.
2.8.4	400KV D/C Varanasi-Sarnath line (Q) (Opening of LILO of one ckt of Sasaram-Allahabad line at Sarnath).	Completion matching with Varanasi S/S.
2.8.5	LILO of 400KV Sasaram-Allabhadad at Varanasi (Q).	Line charged in Mar'16.
2.9	**Northern Region System Strengthening Scheme - XXVI**	
2.9.1	765KV S/C Meerut - Moga line	Line commissioned in May'15.
2.10	**Northern Region System Strengthening Scheme - XXVIII**	
2.10.1	Ext. of one ckt 400KV D/C Biharshariff - Sasaram to Varanasi (Q)	Line commissioned in Mar'16.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
2.10.2	LILO of 765KV S/C Gaya - Fatehpur line at Varanasi	Commissioned in Mar'16.
2.10.3	400KV D/C Sasaram - Allahabad line (existing) to be shifted from NR bus to ER Bus (Q)	
2.11	**Strengthening Scheme in Northern Region**	S/stn. extn balance, expected by Jun'16.
2.11.1	LILO of 220KV D/C Jullandhur-Hamirpur line at Hamirpur (PG)	Loop out charged in Dec.'13. Loop in charged in Feb'15 (19 Ckm)
2.12	**Northern Region System Strengthening Scheme -XXVII**	
2.12.1	LILO of 400KV S/C Dehar-Bhiwani line at Rajpura (PSTCL)	Line completed. Commissioning matching with Rajpura extn. Rajpura (PSTL) S/stn. Critical.
2.12.2	LILO of 400KV S/C Dehar-Panipat line at Panchkula	Line commissioned in Mar'15
2.13	**Trans. System Associated with Meja TPS.**	**Generation project delayed.**
2.13.1	400KV D/C Meja - Allahabad line	Work slowed down to the extent feasible matching with Gen.
2.14	**Transmission System Associated with RAPP 7 & 8 - Part-A.**	**Generation project delayed.**
2.14.1	400KV D/C RAPP - Kota line	Forest clearance for Bundi (93 HA.) & Kota (8.99HA) Div are awaited. 77nos. location are in forest.
2.15	**Northern Region System Strengthening Scheme -XXV**	
2.15.1	765KV S/C Jaipur (RVPNL) - Bhiwani line (IInd Ckt)	ROW issue on 2 nos. fdn. & 6 nos. TE at Bhiwani end.
2.15.2	400KV D/C Bhiwani - Hissar line	Line commissioned on 30.10.15.
2.15.3	LILO of 400KV D/C Moga -Bhiwadi line at Hissar	Line commissioned in Jun'15.
2.16	**Northern Region System Strengthening Scheme -XXX**	
2.16.1	400KV S/C Singrauli - Allahabad line (section of Singrauli-Allahabad line (50 Km) to be strung on existing 400KV D/C tower from Singrauli end)	
2.16.2	400KV D/C Allahabad - Kanpur line	
2.17	**Northern Region System Strengthening Scheme -XXXII**	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
2.17.1	400KV D/C Panchkula - Patiala line (10 Km Multi-ckt towers in forest area near Panchkula)	
2.17.2	400KV D/C Lucknow - Kanpur line	
2.17.3	LILO of 400KV D/C Dadri - Malerkotla line at Kaithal	
2.17.4	LILO of both ckt of 400KV D/C RAPP - Kankroli line at Chittorgarh (RRVPNL). (15Km Multi-ckt & 3 Km D/C)	Award placed in May'14. LILO only one ckt is to be carried out. Scheme has been revised.
2.18	**Transmission System associated with Tehri Pump Storage Plant (PSP)**	
2.18.1	400KV S/C Tehri Gen. - Tehri Pooling Station (Q)	
2.18.2	Charging of Tehri Pooling - Meerut765KV line	Award placed in Feb'15. Engg. in progress.
2.19	**Transmission System associated with Kishanganga HEP**	**Compln. Sch. - 29/38 months from IA**
2.19.1	220KV D/C Kishanganga - Amargarh line	Efforts being made to complete earlier matching with Gen. Project.
2.19.2	220KV D/C Kishanganga - Wagoora line	Work under progress.
2.20	**Northern Region System Strengthening Scheme -XXXIV**	
2.20.1	LILO of Agra - Bharatpur 220KV S/C lina at Agra (PG)	
2.20.2	LILO of Gladni - Hiranagar 220KV S/C lina at Samba (PG)	Scope change - Gladni in place of Sarnba.
2.20.3	LILO of 01 ckt of Parbati PS - Amritsar 400KV D/C line at Jallandhar (PG)	
2.21	**Creation of 400/220KV S/Stn. in NCT of Delhi during 12th Plan Period (Part-A)**	**Compln. Sch. - 26 months from IA**
2.21.1	LILO of both ckt of Bawana - Mandola 400KV D/C line at Rajghat (Multi Ckt tower with twin/HTLS Cond.)	Award under progress.
2.21.2	LILO of one ckt of Bamnauli - Jattikalan 400KV D/C line at Dwarka-I (with twin/HTLS Cond.)	Award under progress.
2.22	**Creation of 400/220KV S/Stn. in NCT of Delhi during 12th Plan Period (Part-B1)**	**Compln. Sch. - 26 months from IA**
2.22.1	LILO of both ckt of Bamnauli - Samaypur 400KV D/C line at Tughlakabad (with twin HTLS Cond.)	Award under progress.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
2.23	**Transmission System Associated with RAPP 7 & 8 - Part - B.**	**Compln. Sch. - 28 months from IA or IA signed by Generator.**
2.23.1	400KV D/C Kota - Jaipur (South) line (part of RAPP-Jaipur (S) 400KV D/C line with one ckt LILO at Kota).	Work under progress.
3.0	**WESTERN REGION**	
3.1	**Western Region Strengthening Scheme - V**	
3.1.1	400KV Vapi (PG) - Kala - Kudus D/C line*	*Due to severe ROW portion at Navi-Mumbai end, Line was decided to be terminated at Kudus S/Stn. of MSETCL. Forest clearance (Stage-I) received in Aug'15. Contigency arrangement to connect Vapi-Navi Mumbai with Navsari-Boisar line by passing ROW area, to from Vapi - Navsari line (24 Ckm) commissioned in Mar'13. 400KV D/C Vapi-Kala portion commissioned in Mar'14 (61 Ckm). Balance ant. to be completed by Dec'16. However, Kudus s/stn. being implementated by MSETCL. Critical
3.1.2	220KV Vapi - Khadoli (UT of DNH) D/C line	Line commissioned in Sep'10.
3.1.3	LILO of Lonikhand (MSEB) - Kalwa (MSEB) 400KV S/C line at Navi Mumbai.	Balance portion (02 Kms) of line being executed using under ground cable. Right of way problem for laying of cable continues. Also 220KV down stream system (under MSETCL) scope) delayed. Critical
3.2	**Transmission System Associated with Mundra Ultra Mega Power Proj.**	
3.2.1	**Part-A - Tr. System of Mundra (UMPP)**	
3.2.1.1	400KV D/C Mundra - Limbdi line (Triple snowbird)	Line commissioned in Feb'12.
3.2.1.2	400KV D/C Mundra - Bachchau line (Triple snowbird)	Line completed in Aug'11 & commissioned in Sep'11.
3.2.1.3	400KV D/C Bachchau - Ranchodpura line (Triple snowbird)	Line completed & commissioned in Sep'11.
3.2.1.4	400KV D/C Mundra - Jetpur line (Triple snowbird)	Part of line (314 Ckm) commissioned in Aug'12 & balance (358 Ckm) commissioned in Dec'12.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
3.2.2	**Part-B - Regional System Strengtheing in WR for Mundra (UMPP)**	
3.2.2.1	400KV D/C Gandhar - Navsari line	Line commissioned in July'12.
3.2.2.2	400KV D/C Navsari - Boisor line	Contigency arrangement to connect Navsari-Boisar with Vapi-Navi Mumbai line by passing forest area, to form Vapi - Navsari line (212 Ckm) commissioned in Mar'13. For balance portion, forest clearance awaited (Stage-I obtained in Mar'16). Severe ROW problem being encountered.
3.2.2.3	400KV D/C Wardha - Aurangabad line (up-gradation 1200KV S/C)	Contract terminated 01 out of 02 nos. due to unsatisfactory performance and fresh tender taken up. The package has been Bifurcated into two package 01 pkg. awarded in Dec'14 and second pkg. in Feb'15. Remaning 01 pkg. also terminated in Aug'15 due to poor performance. However contract was revived in Feb'16.
3.2.2.4	400KV D/C Aurangabad (PG) - Aurangabad (MSETCL) line (Q) (59Km) and Shifting of 400KV Ankola -Aurangabad (MSETCL) to Aurangabad (PG) (Twin) line (51Km)	Ankola-Aurangabad line (PG) twin commissioned in Jan'14 (102 Ckm) Aurangabad-Aurangabad (Q) portion commissioned in Apr'14.
3.2.2.5	LILO of both Ckt of Kawas - Navsari 200KV D/C at Navsari	Linecommissioned in July'12.
3.3	***Establishment of Pooling Station at Champa and Raigarh (near Tamnar) for IPP Gen. Proj. in Chhatisgsrh - B***	*except balance ICT's at Champa to be commissioned progressively by Jun'16.
3.3.1	765KV D/C Champa Pooling station - Raipur Pooling Station line	Line completed & commissioned in May'14 through contingency arrangement (by passing Champa S/S)
3.3.2	765KV D/C Raigarh Pooling station (Near Kotra) - Raigarh Pooling station (Near Tamnar) line	Line commissioned in Oct'13.
3.3.3	765 KV S/C Champa Pooling station - Dharamjaygarh/ near Korba Switching Station line	Line completed & commissioned in May'14 through contingency arrangement (by passing Champa S/S).
3.3.4	765KV S/C Raigarh Pooling Station(Near Kotra) - Champa Pooling station line	Line commissioned on 29.05.15..
3.4	***Transmission System for IPP Generation Projects in Madhya Pradesh and Chhatisgsrh***	Vadodara S/stn. commissioned in Jun'15.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
3.4.1	765KV S/C Indore - Vadodara line	Line commissioned in May'14 (through contigency arrangement) due to delay in Vadodara GIS. Regular operation restored in Jun'15.
3.4.2	400KV D/C Vadodara-Pirana (Quad) line	Line commissioned in Mar'14 (through contigency arrangement by passing Vadodara S/s.) & Regular operation done with Vadodra GIS on 31.05.15.
3.5	***Transmission System strengthening in Western part of WR for IPP Generation Projects in Chhatisgsrh - part-D***	BPTA Schedule May'15.
3.5.1	765KV D/C Wardha - Aurangabad line	Line commissioned in Jul'14
3.5.2	400KV D/C Aurangabad - Boisar line (Quad)	Stage - I Forest clearance (138ha.) received in Aug'15. Severe ROW problem (involvement of grape garden). Critical
3.6	***System Strengthening in North/West part of WR for IPP Proj. in Chhattisgarh. Part - E***	BPTA Schedule May'15.
3.6.1	765KV D/C Aurangabad (PG) - Padghe (PG) line	Forest clearance awaited. Commissioning matching with down stream Padghe-Kudus & Kudus (MSETCL) S/S. MSETCL S/S critical.
3.6.2	400KV D/C Padghe (PG) - Padghe (Kudus) line (Q)	Commissioning of Kudus S/S by MSETCL ctritical. Completion matching with A'bad-Padghe line
3.6.3	400KV D/C Vadodra - Asoj line (Quad)	Line commissioned in Mar'14 (through contigency arrangement by passing Vadodara S/s.) & Regular operation done with Vadodra GIS on 31.05.15.
3.7	***Transmission System for connectivity of Essar Power Gujarat Limited.***	BPTA Schedule May'14. Gen. project delayed.
3.7.1	400KV D/C Essar Gujarat TPS - Bachau line (Triple)	Line completed & charged in Mar'16 (anti theft measure). 09 nos. fdn., 10 nos. tower erection & 3.0 Km streinging which is held-up due to non-finalisation of gantry by Essar Power (Gen. proj uncertain).
3.8	***System Strengthening in Raipur - Wardha Corridor for IPP Project in Chhattisgarh - Part - 6***	* BPTA Schedule Dec'15.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
3.8.1	765KV D/C Raipur Pooling Stn. - Wardha line -II	Stage-I forest clearance (295 Ha) received in Jun'15 & Stage-II recevied in Dec'15.
3.9	***Transmission System Associated with Mauda Stage-II (2x660MW) Gen. Proj.***	
3.9.1	400KV D/C Mauda-II - Betul line (Q)	Severe ROW problem being faced.
3.9.1	400KV D/C Betul - Khandwa line (Q)	Forest clearance (St-I received in Nov'15). Permision to work obtained in Jan'16.
3.9.1	400KV D/C Khandwa - Indore line	Forest clearance (St-I received in Nov'15). Permision to work awaited.
3.10	***Transmission System Associated for Solapur STPP (2x660MW) Gen. Proj.***	
3.10.1	400KV D/C Solapur STPP - Solapur line (Q)	Line commissioned in Apr'15..
3.11	***Inter-Regional System Strengthening Scheme in WR and NR (Part-A)***	
3.11.1	765KV D/C Aurangabad - Solapur line	Line commissioned in Sep'15.
3.12	***Transmission System Associated with KAKRAPAR APP - 3&4***	
3.12.1	400KV D/C Kakrapar APP - Navsari line	Stringing commenced from Mar'16.
3.12.2	400KV D/C Kakrapar APP - Vapi line	
3.13	***Transmission System Associated with LARA STPS - I Gen. Proj. NTPC***	
3.13.1	400KV D/C Lara STPS - Raigarh (Kotra) line	
3.13.2	400KV D/C Lara STPS - Champa PS line (Q)	
3.14	***Transmission System Associated for Solapur STPP (2x660MW) -Part-A***	
3.14.1	400KV D/C Solapur STPP - Solapur line -II (Q)	
3.15	***GREEN ENERGY CORRIDORS:- Inter State Transmission Scheme (ISTS) - Part - C***	Compln. Sch. - 36 months form IA
3.15.1	765KV D/C Bhuj Pool - Banaskanta line	Award under progress.
4.16	***Transmission System for Ultra mega Solar Park in Rewa District, Madhya Pradesh .***	Compln Sch. : 14 months from IA.
4.16.1	LILO of 400KV D/C Vindhyachal - Jabalpur line (Q) (IInd Ckt.) at Rewa Pooling Stration .	Award placed in Feb'16.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
4.17	***Transmission System Strengthening associated with Mundra UMPP (Part-A)***	Compln Sch. : 30 months from IA.
4.17.1	LILO of 400KV D/C both ckt of Mundra UMPP-Limbdi (Triple) at Bachau.	Award placed in Feb'16.
4.0	**SOUTHERN REGION**	
4.1	**Kaiga 3 & 4 Trans. System (Balance Line)**	
4.1.2	400 KV D/C Mysore - Kozhikode line	Line commissioned in 14.10.15
4.2	**Kundankulam - APP Trans. System (Balance lines)**	
4.2.1	Edamon (KSEB) - Muvattupuzha (PG) D/C (Quad) line	G.O. issued by Govt. of Kerala dated on 19.08.14 recommending additional compensation by land owner. Work to start after assesment of compensation & payment by State Govt./ KSEB. Revised G.O. with enhansed compensation issued in Jan'15. Recently G.O. issued on 30.07.15 in which compensation to be done on land value, to be finalised by concerned DC.
4.2.2	Kundankulam (NPC) - Tirunelveli(PG) D/C (Quad) line -I	Commissioned.
4.2.3	Kundankulam (NPC) - Tirunelveli (PG) D/C (Quad) line -II	Commissioned.
4.2.4	Tirunelveli (PG) - Udumalpet (PG) D/C line	Commissioned.
4.2.5	Tirunelveli (PG) - Edamon (KSEB) Multi -Ckt line	Commissioned.
4.2.6	Muvattupuzha (PG) - North Trichur (PG) D/C (Quad) line	Commissioned.
4.2.7	LILO of both ckt of Maduri (PG) - Trivendrum (PG) D/C line at Tirunelveli	Commissioned.
4.3	**System Strengthening - XII of SR**	* Completion uncertain.
4.3.1	LILO of Neelamangla - Hoddy 400KV S/C line & LILO of Somanhally-Hoddy 400KV S/C line at Yelahanka through Multi - Ckt.	*ROW problem continues. Completion uncertain. Work commenced in Jan'14. However work again stopped due to agitation.
4.4	**Common System Associated with Costal Energen Private Ltd and Ind-Barath Power Ltd. (LTOA) Gen. Proj. in Tuticorin area Part - B.**	BPTA Schedule Dec'14.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
4.4.1	765KV D/C Tuticorin Pooling Station - Salem Pooling Station line (initialy charged at 400KV)	
4.4.2	400KV D/C Salem Pooling Station - Salem line (Quad)	Erection completed. Commissioning matching with Salem - Somanahali line.
4.4.3	765KV S/C Salem Pooling Station - Madhugiri Pooling Station line (initialy charged at 400KV)	Severe ROW being faced in Karnataka. Critical
4.5	**System Strengthening - XIII of SR Grid**	
4.5.1	400KV D/C Gooty - Madhugiri line	Line commissioned in Nov'15.
4.5.2	400KV D/C Madhugiri - Yelhanka line (QUAD)	Prolonged severe ROW in Karnataka. Effort being made for resolving
4.6	**System Strengthening in SR - XIV**	* Completion uncertain
4.6.1	400KV D/C Dharmapuri (Salem New) - Somanahalli line	Severe ROW problem faced in Karnataka. Critical. Issues to related compensation not yet resolved.
4.7	**Common Trans. Scheme Associated with ISGS Project in Vemagiri Area of Andhra Pradesh - Part - A1.**	Scheme under review in view of CERC direction.
4.7.1	LILO of Gazuwaka - Vijayawada 400KV S/C line at Vemagiri Pooling Stration .	Line cancelled in this scheme
4.8	**System Strengthening in SR - XVIII**	
4.8.1	400KV D/C Vijayawada - Nellor line	Ready for commissioning in Jul'15 & commissioned in Aug'15.
4.8.2	400KV D/C Nellor - Thiruvalam line (Quad) incl. common portion of LILO at Tiruvalam - 26 Locs.	Line commissioned in Apr'14.
4.8.3	400KV D/C Thiruvalam - Sholinganallur (Melakotiyuar) line	Line commissioned in Jul'14.
4.8.4	LILO of Bangalore - Salam 400KV S/C line at Hosur	Line commissioned in Jan'14
4.9	**Transmission System Associated with Contigency plan for Evacuation of Power from IL&FS (2x600MW)**	
4.9.1	LILO of 2nd Ckt of Neyveli - Trichy 400KV D/C line at Nagapattnam Pooling Stn.	Line commissioned in Sep'15.
4.9.2	Strengthening of Neyveli TS -II to Neyveli TS-I expension link with higher capacity conductor	Line commissioned in Nov'15.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
4.10	**System Strengthening in SR - XXII**	
4.10.1	765KV S/C Kurnool (New) - Raichur line	Line commissioned in Dec'15.
4.11	**Trans. System for connectivity for NCC Power Project LTD**	
4.11.1	400KV D/C NCC Gen. Sw Yd. - Nellor PS line (Q)	Line commissioned in Mar'16.
4.12	**Sub station works associated with System Strengthening in SR for Inport of Power from ER.**	
4.12.1	LILO of Gazuwaka - Vijayawada 400KV S/C line at Vemagiri Pooling Stration .	
4.13	**Sub station works associated with Hyderabad (Maheshwaram) Pooling Station**	
4.13.1	LILO of Hyderabad - Kurnool 400KV S/C line at Maheshwaram Sub Stration .	Award placed in Mar'15. Engg. & survey under progress.
4.14	**Transmission System for Ultra mega Solar Park in Anantpur District, Andhara Pradesh - Part-A (Phase-I)**	
4.14.1	LILO of 400KV S/C Kadapa (Cuddapah) - Kolar line at NP Kunta Pooling Stration .	Work under progress.
4.15	**System Strengthening - XXIV in Southern Region**	
4.15.1	LILO of 765KV D/C Kurnool - Thiruvalam line at Cuddapah.	Award placed in Feb'16.
4.15.2	400KV D/C Cuddapah - Hindupur line (Q)	Award placed in Jan'16.
4.16	**Connectivity for Kudankulam 3&4 with Inter-state Transmission system**	
4.16.1	Extn. of 400KV D/C Kudankulam APP - Tirunveli line (Q)	Award under progress.
4.17	**Transmission System for Ultra mega Solar Park in Anantpur District, Andhara Pradesh - Part-B (Phase-II)**	Compln Sch. : (16 LILO in & 30 LILO out) months from IA.
4.17.1	LILO of 400KV D/C Cuddapah - Hindupur line (Q) (both Ckts) at NP Kunta Sub Stration .	Award placed in Jan'16.
4.18	**Removal of Constraints in 400KV Bays Extn. at 400KV Vemagiri S/stn.**	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
4.18.1	Both ckts of one LILO D/C portion of Simhadri - Vijayawada 400KV line at Vimagiri-I (AP) shall be LILOed at Vimagiri-II (PG) - (D/C portion (1.8 Km) & Multi Ckt portion (13.2 Km).	Award placed in Mar'16.
4.18.2	Both ckts of IInd LILO D/C portion of Simhadri - Vijayawada 400KV line at Vimagiri-I (AP) shall be LILOed at Vimagiri-II (PG). There shall be no loop out. The open section of 400KV D/C line from Vemagiri-I (AP) shall be used for termination of 400KV Kota line.	Award placed in Mar'16.
5.0	**<u>EASTERN REGION</u>**	-
5.1	**Transmission System for Development of Pooling Station in Northern Region Part of West Bengal and Transfer of Power from BHUTAN to NR/WR.**	Gen. project delayed (ant. in 2017 -18). Works slowed down to the extent feasible to match Genaration.
5.1.1	LILO of Bishwanath Chariali - Agra HVDC line at New Pooling Station in Alipurduar for parallel operation of the HVDC stn.	Work under progress. Commissioning matching with associated HVDC terminal.
5.1.2	LILO of 400KV D/C Bongaigaon - Siliguri line (Pvt. Sector line) at New Pooling Station in Alipurduar	Completion matching with Alipurduar PS.
5.1.3	LILO of 400KV D/C Tala - Siliguri line at New Pooling Station in Alipurduar	SCOPE DELETED.
5.1.4	400KV D/C Punatsangchu-1 (Gen. Proj. in Bhutan) - Alipurduar line (HTLS Cond.) India Portion.	Wild life sanctuary involved. Case processed at NBWL & forwarded to State for further processes. Gen. expected beyond 2017-18.
5.1.5	LILO of 220KV D/C Birpara - Salakati line at New Pooling Station in Alipurduar	Completion matching with Alipurduar PS.
5.2	**Transmission System for Transfer of Power from Generation Project in SIKKIM to NR/WR Part - A.**	ICT-II expected by May'16
5.2.1	LILO of Siliguri (Existing) - Purnea 400KV D/C line (Q) at New Pooling station at Kishanganj	Line commissioned in Mar'16.
5.2.2	LILO of Siliguri - Dalkhola 220KV D/C line at New Pooling station Kishanganj	Line commissioned in Mar'16.
5.3	**Eastern Region Strengthening Scheme - III**	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
5.3.1	400KV D/C Sasaram - Deltonganj line	Completion matching with Daltanganj S/s delayed due to non-availibility of sub station land (land acquired in May'15).
5.3.2	LILO of 400KV D/C Baripada - Mendhasal at Pandiabil (In place of 400KV D/C Mendhasal-Uttra line)	Completion matching with Pandiabil sub station.
5.3.3	LILO of 400KV D/C Kahalgaon - Biharshariff line (Ist line) at Lakhisarai	Line commissioned in Mar'14
5.3.4	LILO of 400KV D/C Kahalgaon - Biharshariff line (2nd line) at Banka	Line commissioned in Nov'12.
5.3.5	LILO of 400KV S/C Meramundali - Jeypore line at Bolangir	Line commissioned in Aug'12.
5.3.6	LILO of 400KV S/C Rengali - Baripada line at Keonjhar	Line commissioned in Jan'13.
5.3.7	LILO of 400KV D/C (one ckt) Baripada - Mendhasal line at Dubri (OPTCL)	Line ready for commissioning in Jul'15 & commissioned alongwith extn. of Dubri (OPTCL) S/s in Aug'15
5.3.8	LILO of 400KV D/C (both ckt) Jamshedpur - Rourkela line at Chaibasa	Line charged & ready for commissioning in Nov'14.
5.4	**Transmission System for Phase-I Generation Projects in ORISSA- Part- A.**	
5.4.1	765KV S/C Angul Pooling station - Jharsuguda Pooling station line -I (Incl. Common D/C portion -212 locs. of total line)	Line commissioned in Mar'15.
5.4.2	765KV S/C Angul Pooling station - Jharsuguda Pooling station line -II	Line commissioned in Jan'16
5.4.3	LILO of 400KV D/C Rourkela - Raigarh at Jharsuguda Pooling stn.	Ckt-I of LILO line commissioned in Mar'13 (44 Ckm) & Ckt-II in May'13 (44 Ckm).
5.4.4	LILO of 400KV S/C Meramunali - Jeypore at Angul Pooling stn.	LILO line commissioned in Mar'13.
5.4.5	LILO of one ckt 400KV D/C Talchar - Meramundali at Angul Pooling station.	Line commissioned in Mar'14.
5.5	**Transmission System for Transfer of Power from Generation Project in SIKKIM to NR/WR Part - B.**	
5.5.1	400KV D/C Kishanganj - Patna line (Quad)	Line commissioned in Mar'16.

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
5.5.2	LILO of 400KV D/C Teesta-V - Siliguri line at Rangpo (1 D/C & 1.5 M/C)	Ckt-I (7 Ckm) commissioned in Apr'14 & Ckt-II (8 ckm) commissioned in Oct'14.
5.5.3	LILO of Teesta-III - Kishanganj 400KV D/C (Q) at Rangpo (21 D/C+1.5 M/C) (being constructed under JV route)	LILO - IN portion completed & test charged in Mar'16. LILO - OUT now being proposed for deferement due to delayed clearance/Generation.
5.5.4	220KV D/C Rangpo - New Melli line (twin moose) (20.5 D/C & 1.5 M/C)	Line commissioned on 19.05.15
5.5.5	LILO of 132KV S/C Gangtok - Rangit line at Rangpo	Ckt-I commissioned in Apr'14 (terminated as Chuzachan)-1 Ckm. Balance commissioned in Nov'14.
5.6	**Transmission System for Phase-I Generation Projects in Jharkhand and West Bengal - Part - A1.**	**Gen. Project delayed (ant. in 2016-17 & beyond)**
5.6.1	400KV D/C Ranchi - Jharkhand Pooling Stn. line (Quad)	Testing under progress. Completion matching with Jharkhand Pool & Jharkhand Pool bay at line.
5.6.2	400KV D/C Jharkhand Pool - Gaya line (Quad)	Permission to work received in May'15. Repeated stoppage of work by extremists affecting progress.
5.7	**Split Bus Arrangement for avrious Sub Stations in Eastern Region**	
5.7.1	400KV D/C trans. Line for swapping of Purnea baya (1&2) with Sasaram bays (#3&4) at Biharshariff S/Stn.	ROW problem being encountered. Critical.
5.7.2	400KV D/C trans. Line for swapping of Kahalgaon #1 bay with Sasaram # 1 bay at Biharshariff S/Stn.	Commissioned in Apr'15.
5.7.3	400KV D/C trans. Line for reconfiguration of Biharshariff Ckt III&IV from its present position to St.-II side of Kahalgaon Sw. yd. of NTPC	Bay at NTPC yet to be awarded. Critical
5.8	**Eastern Region Strengthening Scheme-V**	
5.8.1	400KV D/C Rajarhat - Purnea line (Tripal) (with LILO of one ckt at Gokarana (WBSETCL) & other ckt at Farraka (NTPC).	Severe ROW problem in Jharkhand area.
5.8.2	LILO of Subhashgram -Jeerat 400KV S/C line at Rajarhat	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
5.9	**Eastern Region Strengthening Scheme - XIII**	
5.9.1	Re- conductoring of 400KV D/C Farakka-Malda line (HTLS Cond.) with associated bays.	Line charged in Mar'16
5.10	**Transmission System Associated with Darlipalli TPS**	Compln Sch. 29 months from IA.
5.10.1	765KV D/C Darlipalli TPS - Jharsuguda (Sundergarh) Pooling Stn. line	Award placed in Jan'16.
6.0	**NORTH EASTERN REGION**	-
6.1	**Trans. System associated with Pallatana gas Based Power Project and Bongaigaon Thermal Power Station (BTPS)**	
6.1.1	400KV D/C Bongaigaon TPS - Bongaigaon line	Line completed & ready for commissioning. Commissioning held up due to Gen. delayed.
6.1.2	400KV D/C Pallatana - Surajmaninagar line (charged at 132KV)	Line completed & test charged in Jun'12.
6.1.3	400KV D/C Silchar - Purba Kanchan Bari line (charged at 132KV)	Line commissioned in Jul'15
6.1.4	400KV D/C Silchar - Melriat (New) line (charged at 132KV)	Major portion of line in forest. Severe ROW in vicinity of Aizwl town due to stiff resistance from Influential local owner. Package under re-tendering.
6.1.5	400KV D/C Silchar - Imphal (New) line (charged at 132KV)	Line commissioned in Mar'15. (charged at 132KV).
6.1.6	220KV D/C Mariani(New)-Mokikchung (PG)	Line commissioned in Jul'15
6.1.7	132KV Silchar - Badarpur (PG) Switching station Interconnecting 132KV D/C line	Line commissioned in April.'12.
6.1.8	132KV D/C Melriat (New) - Sihmui line	Ist stage forest clearance awaited. Package under re-tendering.
6.1.9	LILO of 01 ckt at 132KV Aizwol (PG) - Zemabawk (Mizoram) at Melriat (PG)	Package under re-tendering.
6.1.10	132KV D/C Silchar - Srikona (AEGCL) line	Line commissioned in Mar'12.
6.1.11	LILO of 132KV D/C Panchgaram -Dullovcherol at Silcher line (contigancy arrangement of Silchar - Halaikandi line)	Line test charged on 13.06.12. Balance line by Jun'16.
6.1.12	132KV D/C Mokokchung(PG) - Mokokchung((Nagaland) line	Line commissioned in Jul'15

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
6.1.13	132KV S/C Pasighat - Roing line (on D/C)	Readiness of up stream & down stream system being implemented by Arunachal Pradesh Govt. critical for commissioning of line. Damage towers/fdns. Being taken up for rectification/re-casting.
6.1.14	132KV S/C Roing - Tezu line (on D/C)	Progress affecetd due to ROW problem (geographical condition). Critical
6.1.15	132KV S/C Tezu - Namsai line (on D/C)	Progress affecetd due to ROW problem (geographical condition). Critical
6.1.16	LILO of 400KV S/C Kaithalguri - Misa line at Mariani (New) (Charged at 220KV)	Line commissioned in Mar'13.
6.1.17	LILO of 132KV S/C Loktak - Imphal (Mizoram) line at Imphal (PG)	Line commissioned in Mar'13.
6.2	**Radial Interconnection Between India (NER) and Bangladesh - India Portion**	
6.2.1	400KV D/C Surjamaninagar (Tripura) - Indo-Bangladesh Border line (operated at 132KV)	Line commissioned in Jan'16.
	TBCB Lines	
1	**System Strengthening in Southern Region for Import of Power from Eastern Region**	
	765KV D/C Srikakulam PP -Vemagiri-II PS	
	400KV D/C Khammam - Nagarjunsagar line	Line completed & test charged in Dec'15.
2	**Transmission System pertaining to IPPs of Nagapattinum/Cuddalore Area.**	
	765KV D/C Nagapattinam - Salem line	
	765KV S/C Salem - Madhugiri line	Severe ROW problem is being faced.
3	**Associated Transmission System of Unchahar TPS.**	
	400KV D/C Unchahar - Fatehpur Line	Work under progress.
4	**Northern Region Strengthening Scheme - XXXI (Part-A)**	
	LILO of 400KV D/C Abdullapur - Karcham Wangtoo at Kala Amb.	Award under progress.
5	**Transmission System Strengthening Associated with Vindhyachal -V**	

क्रमांक Sl. No.	पारेषण लाईन का नाम Name of the Trans line	Remarks / Constraints & assistance required.
	765KV D/C Vindhyachal - Jabalpur line	Award under progress.
6	**Transmission System Associated with Gadarwada STPPS of NTPC (Part-A).**	
	765KV D/C Gadarwara - Jabalpur Pool line	
	765KV D/C Gadarwara - Warora Pooling Stn. line	Award placed in Dec'15.
	LILO of 2xD/C 400KV Wardha - Parli line at Warora Pooling Stn. (Q)	Award placed in Jan'16.
7	**Transmission System Associated with Gadarwada STPPS of NTPC (Part-B).**	
	765KV D/C Warora Pooling Stn. - Parli line	Award placed in Feb'16.
	765KV D/C Parli - Solapur line	Award placed in Dec'15.
	400KV D/C Parli - Parli line (Q)	Award placed in Dec'15.
8	**Beyond Vemagiri Transmission System**	
	765KV D/C Vemagiri - Chilakaluripeta line	Award placed in Mar'16.
	765KV D/C Chilakaluripeta - Cuddapah line	Award placed in Mar'16.
	400KV D/C Cuddapah - Madhugiri Trans. line (Q)	Award placed in Mar'16.
	400KV D/C Srikakulam - Garividi Trans. Line (Q)	Award placed in Mar'16.
	400KV D/C Chilkaluripeta - Narasaraopeta Trans. Line (Q)	Award placed in Mar'16.
	Other Consultancy Project	
	Leh Transmission System	
	220KV S/C Alusteng - Drass - Kargil - Khalsti - Leh Trans. Line	Work under progress

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CHAPTER-7

TRANSMISSION SYSTEM REQUIREMENT UPTO 2021-22

7.1 FORMULATION OF TRANSMISSION PLAN

7.1.1 Planning of the transmission system for a particular timeframe takes into account the plans formulated by CEA and the generation projects being taken up for execution in that timeframe. The transmission system requirement covers the power evacuation system from the generation projects and system strengthening of the network for meeting the load growth in that time frame. The transmission system is evolved keeping in view the overall optimization on a National level. In this process the total investment in transmission including the inter-state as well as intra-state system is optimized. Based on the perspective plan developed by CEA and depending upon as to which generations are likely to be available during the next 3-4 years and also taking into account the load growth in particular areas, CTU or STUs have to prioritize, review (if required) and take up their transmission system expansion programme for implementation.

7.1.2 Accordingly, the transmission system is continuously planned, that covers the whole of ISTS and Intra-STS transmission network. Based on these, studies were carried out as discussed in detail under Chapter-5 for assissing transmission requirement under various scenarios, up to 2021-22.

7.1.3 Further, as part of preparing Perspective Transmission Plan for 20 years in August, 2014 and Advance Perspective Transmission plan in January, 2016. Some of the states also sent their transmission system proposal for their Intra-state network, which covers the transmission plan up to 66 kV level. This has also been considered while assessing transmission requirement for 13th Plan.

7.1.4 It is broadly seen that the system that has been planned through the coordinated planning process i.e. through regional Standing Committee(s) on Power System Planning, is adequate to cater to various load-generation scenarios including RES generation. This system would be possible to meet the load as assumed in this document. However, as 19th EPS is under finalization, the exact requirement can agin be worked out after firming up of the EPS forecast figures.

This transmission system is also seen to evacuate power from the upcoming generations within the scenarios considered in detail in Chapter-5.

7.2 TRANSMISSION REQUIREMENT UP TO 2021-22

7.2.1 The total system required for period up to 2021-22 has been compiled and presented in this report in following sub head:

(i) Inter-Regional Transmission Links

(ii) Reactors including dynamic compensation

(iii) Interconnection with neighbouring countries

(iv) Transmission system planned & agreed in Standing Committee Meetings of five regions, including both ISTS and Intra-STS.

(v) The additional transmission system submitted by some states for their network augmentation.

7.3 INTER-REGIONAL TRANSMISSION LINKS

To cater to above import/export requirement of various regions, a number of inter-regional transmission corridors have already been planned. These high capacity transmission corridors are in various stages of implementation and most of these are likely to be commissioned by 2021. Details of the Ongoing Inter-Regional Transmission Capacity Addition are available at Annex- 7.1. A summary of these corridor capacities is given below:

INTER-REGIONAL TRANS. LINKS & CAPACITY (MW)				
Inter-Regional corridors	**Present (as on Nov 2016)**	**Expected by end of 12th Plan**	**Addition expected during 13th Plan**	**Expected by end of 13th Plan (2021-22)**
West - North	13920	16920	19800	36720
North East - North	3000	3000	0	3000
East - North	19530	21030	1500	22530
East - West	12790	12790	8400	21190
East - South	3630	7830	0	7830
West - South	7920	7920	16000	23920
East - North East	2860	2860	0	2860
Total	**63,650**	**72,350**	**45,700**	**1,18,050**

Thus the total inter-regional capacity addition planned during 13th plan is about 45,700 MW. With the above addition, the total inter-regional capacity would grow from 63,650 MW at present to about 118,050 MW by the end of 13th Plan.

Transmission capacity of Inter-Regional Links and Trasfer capability between two regions: The summation of the transmission capacities of Inter-Regional links is a figurative representation of the bonds between the regions. These aggregate numbers do not indicate actual power transfer capability across different regions/states. The power transfer capability between the two points in a grid depends upon a number of variable factors. Such as load flow pattern, voltage stability, angular stability, loop flows and line loading etc. The system operator has to assess the transfer capability between two points of the grid from time to time and restrict the power flow accordingly.

7.4 REACTIVE COMPENSATION

7.4.1 Voltage control in an electrical power system is important for proper operation for electrical power equipment to prevent damage such as overheating of generators and motors, to reduce transmission losses and to maintain the ability of the system to withstand and prevent voltage collapse. Voltage control is essential on account of several reasons namely,

- Power-system equipment are designed to operate within a range of voltages, usually within ±5% of the nominal voltage.
- Reactive power consumes transmission and generation resources. To maximize the amount of real power that can be transferred across a congested transmission interface, reactive-power flows must be minimized.
- Reactive power flow on transmission system incurs real-power losses. Both capacity and energy must be supplied to replace these losses.

7.4.2 The above reasons necessitate proper reactive power management in power system. In order to give adequate reactive compensation in transmission lines and substations, bus as well as line reactors are planned. A large number of such compensation devices are under implementation in India (expected by 2021-22) and summary of the same is as given in the tables below:

Summary of Under Implementation Bus Reactors in India till 2021-22					
Region	Plan	MVAr Compensation		Cost (in Cr)	
		765kV	400kV	765kV	400kV

Summary of Under Implementation Bus Reactors in India till 2021-22					
Region	**Plan**	**MVAr Compensation**		**Cost (in Cr)**	
ER	**12th**	0	1580	0	222
	13th	1320	2455	150	350
NER	**12th**	0	320	0	58
	13th	0	1820	0	273
NR	**12th**	0	955	0	165
	13th	720	1375	118	232
SR	**12th**	810	80	106	17
	13th	3360	1813	436	292
WR	**12th**	240	125	39	21
	13th	2700	1063	399	184
ALL INDIA	**12th**	1050	3060	146	483
	13th	8100	8526	1102	1332
Total till 13th Plan end (Voltage-wise)		9150	11586	1248	1815
Total MVAr & Cost Figures by end of 13th Plan		**20736**		**3063**	

Summary of Under Implementation Line Reactors in India till 2021-22					
Region	**Plan**	**MVAr Compensation**		**Cost (in Cr)**	
		765kV	**400kV**	**765kV**	**400kV**
ER	**12th**	0	760	0	69
	13th	4020	1266	340	115
NER	**12th**	0	0	0	0
	13th	0	412	0	37
NR	**12th**	0	200	0	18
	13th	1200	886	101	81
SR	**12th**	2744	0	232	0
	13th	6846	852	578	78
WR	**12th**	2100	1452	177	132
	13th	14280	446	1207	41
ALL INDIA	**12th**	4844	2412	409	219
	13th	26346	3862	2226	351
Total till 13th Plan end (Voltage-wise)		31190	6274	2636	571
Total MVAr & Cost Figures by end of 13th Plan		**37464**		**3206**	

7.4.3 In addition to the above compensation devices that provide reactive power support to the grid under steady state conditions, several Dynamic

Compensation devices such as Static Var Compensators (SVCs) and Static Compensators (STATCOMs) are under implementation in the ISTS network of India. These devices have been primarily planned to provide dynamic stability to the Grid under contingency conditions and to provide a fast and robust system response to severe disturbances in the grid where voltage recovery is critical. Details of such devices which are under implementation and expected to get commissioned during the 12th / 13th Plan are as given below:

Sl. No.	Location	Dynamic Compensation (STATCOM) (MVAr)	Dynamic Compensation (SVC) (MVAr)	Mechanically Switched Compensation (MVAR)		Plan	Estimated Cost (Cr. Rs)
				Reactor	Capacitor		
	Northern Region						
1.	Nalagarh	± 200		2 x 125	2 x 125	13th	431.89
2.	New Lucknow	± 300		2 x 125	1 x 125		
3	New Wanpoh		(+)300/(-)200			12th	829.98
4	Kankroli		(+)400/(-)300				
5	Ludhiana		(+)600/(-)400				
	Western Region						
3.	Solapur	± 300		2 x 125	1 x 125	13th	1071.24
4.	Gwalior	± 200		2 x 125	1 x 125		
5.	Satna	± 300		2 x 125	1 x 125		
6.	Aurangabad (PG)	± 300		2 x 125	1 x 125		
	Southern Region						
7.	Hyderabad (PG)	± 200		2 x 125	1 x 125	13th	562.25
8.	Udumalpet	± 200		2 x 125	1 x 125		
9.	Trichy	± 200		2 x 125	1 x 125		
	Eastern Region						
10.	Rourkela	± 300		2 x 125	-	13th	766.21
11.	Kishanganj	± 200		2 x 125	-		
12.	Ranchi (New)	± 300		2 x 125	-		
13.	Jeypore	± 200		2 x 125	2 x 125		
					Total	12th	**829.98**
						13th	**2831.59**
						Grand Total	**3661.57**

Hence, dynamic compensation devices estimated at around 3662 Cr INR are under implementation which includes cost of SVCs in Northern Region which are expected to get commissioned shortly (in 12th Plan). The remaining would be implemented progressively during 13th Plan period.

7.5 INTERCONNECTION WITH NEIGHBOURING COUNTRIES

7.5.1 India and Bangladesh

Existing Interconnections

The 1st Cross border transmission interconnection between India and Bangladesh through Baharampur (India) - Bheramara (Bangladesh) 400kV D/c line along with 500MW HVDC Back-to-Back terminal at Bheramara, was commissioned in Sept 2013. This interconnection connects Eastern Region of India with Western part of Bangladesh. Up to 540 MW of power is being transferred from India to Bangladesh through this link.

The 2nd 400kV interconnection line between India and Bangladesh which is 56 km long Surjyamaninagar (Tripura) – North Comilla – South Comilla D/c radial interconnection for import of 100MW power from Tripura side of India to the Eastern side of Bangladesh was commissioned on March, 2016. The line is presently operated at 132kV and power upto 100MW is being transferred from India to Bangladesh through the line.

With the commissioning of 2nd cross border transmission interconnection, Bangladesh has been connected with both Eastern and North Eastern Region of India and up t 640 MW of power can be transferred from India to Bangladesh.

Interconnection by end of 13th plan

The capacity of Bheramara (Bangladesh) HVDC station is planned to be enhanced to 1000MW and the same is likely to be commissioned by 2018.

More interconnections with Bangladesh are under consideration which would further enhance the power transfer capacity between the two countries.

As part of ongoing India - Bangladesh cooperation in power sector additional interconnection between Indian grid and the northern part of Bangladesh grid has been envisaged. Accordingly, a 765kV (initially to be charged at 400kV) high capacity AC link interconnecting NER(India), Bangladesh and NR(India) has been planned to interconnect Parbotipur/Barapukuria in Bangladesh with

Katihar in Eastern Region of India and Bornagar in North Eastern Region of India. In addition to strengthening connectivity of NER with rest of the country, Bangladesh would also be able to import 1000 MW power. This proposal involves ing NER(India) – Bangladesh – ER(India) interconnection and 500MW HVDC back-to-back station at Bangladesh in first phase and 1000 MW in final phase. This proposal is under advance stage of finalization.

7.5.2 India and Nepal

Existing Interconnections

At present about 13 nos. of cross border radial interconnection between India and Nepal at 11kV, 33kV and 132 kV are in operation. Further, the 400 kV D/C Dhalkebar(Nepal) - Muzaffarpur(India) line (operation at 132kV) between the two countries was commissioned in Feb'16 and the said line was also inaugurated on 20th Feb'16 by Hon'ble PMs of both India and Nepal. Currently about 300-320 MW power is being supplied to Nepal by India including 70MU/year free power from Tanakpur HEP (3x40 MW) and 80 MW of power through Dhalkebar(Nepal) - Muzaffarpur(India) line.

Interconnection by end of 13th plan

With the commissioning of 132 KV Raxaul-Parwanipur and Kataiya-Kushaha line and upgradation of 400 KV D/C Dhalkebar-Muzzafarpur line to 220 KV (presently it is charged at 132 KV), the export of power to Nepal would increase by 250 MW.

The Muzaffarpur (India)- Dhalkebar (Nepal) 400 kV D/c line is expected to be operated at its rated voltage by Dec.'17 which would further enhance the power transfer to Nepal by 300-400 MW.

More interconnections with Nepal are under consideration which would further enhance the power transfer capacity between the two countries. It has been assessed that in the 2018-19 condition, Nepal is expected to be deficit of about 1000MW during the peak conditions while during 2021-22, 2025 and 2035 Nepal is expected to have net exportable surplus of about 5.7GW, 13.2GW and 24.9GW respectively. The comprehensive transmission plan comprises of Generation Linked Schemes, India-Nepal Cross-Border Interconnections, East-West Power Highway in Nepal and other strengthening system in Nepal for 279 hydro projects with aggregate installed capacity of about 27.8GW by 2035 have also been worked out through joint studies by India and Nepal.

7.5.3 India and Bhutan

India and Bhutan already have existing arrangements for exchange of power. Bulk power generated at Tala HEP (1020 MW), Chukha HEP (336 MW) and Kurichu HEP (60 MW) in Bhutan is exported to India through 400kV, 220kV and 132kV lines, respectively. The basin-wise installed capacity of various hydro projects in Bhutan at present and envisaged to come up by the end of 13th plan is given below:

Sl.	Name of the Generating Station	Existing	by 2021-22
Wangchhu Basin			
1	Tala	1020	1020
2	Chukha	336	336
	Sub Total (Wangchhu basin)	1356	1356
Punatsangchhu basin			
3	Dagachhu	126	126
4	Punatsangchu-I		1200
5	Punatsangchu-II		1020
	Sub Total (Punatsangchhu basin)	126	2346
Mangdechhu basin			
6	Mangdechu		720
	Sub Total (Mangdechhu basin)	-	720
Drangmechhu basin			
7	Kuruchu	60	60
	Sub Total (Drangmechhu basin)	60	60
	TOTAL	**1542**	**4482**

Accordingly, about 4482MW hydro projects are envisaged to come up in Bhutan by 2021-22. The following interconnection has been planned for exchange of power with Bhutan:

Existing Interconnection

— Chukha HEP (Bhutan) – Birpara (ER) 220kV 3 circuits

— Kurichu HEP (Bhutan) - Geylegphug (Bhutan) - Salakati (ER) 132kV S/c

— Tala HEP (Bhutan) - Siliguri (ER) 400kV 2xD/c

Interconnection by end of 13th plan

— Punatsangchu HEP- Alipurduar 400kV D/c (Quad Moose) : 170 km.
— Jigmeling - Alipurduar 400kV D/c (Quad Moose) : 198 km.

Following strengthening has been identified for dispersal of power in the Indian grid from Alipurduar (ER):
— Alipurduar – Siliguri 400kV D/c line (quad)
— Kishanganj – Darbhanga 400kV D/c line (quad)

7.5.4 India and Srilanka

A Memorandum of Understanding was signed between the Govt. of India, the Govt. of Sri Lanka, the Power Grid Corporation of India Ltd.(POWERGRID) and the Ceylon Electricity Board(CEB) on 9th June, 2010 for carrying out feasibility study for interconnection of India-Sri Lanka Electricity Grids. POWERGRID, India and CEB (Ceylon Electricity Board), Sri Lanka was appointed as executing agencies for the above project. So far, following cross-border link between India and Sri Lanka is under study/discussion:

- 2x500MW HVDC bipole line from India(Madurai) to Sri Lanka (Anuradhapura-New): 370km
  - Overhead Line (India): Madurai to near Dhanushkodi
  - Submarine Cable: Dhanushkodi (India) to Talaimannar (Sri Lanka) Overhead Line (Sri Lanka): Talaimannar to Anuradhapura(New): 150km
- 2x500MW HVDC terminal stations each at India(Madurai) to Sri Lanka (Anuradhapura-New)

Presently, technical, economic, commercial and implementation feasibility of this link is being explored through mutual efforts of both the countries.

7.6 TRANSMISSION SYSTEM PLANNED & AGREED IN STANDING COMMITTEE MEETINGS OF FIVE REGIONS, INCLUDING BOTH ISTS AND INTRA-STATE TRANSMISSION SYSTEM

The details of total list of transmission system under different regions which are planned and approved in various SCPSP meetings are given at Annex- 7.2. The state schemes approved in recent SCMs for perspective plan are given at Annex- 7.3.

7.7 THE ADDITIONAL TRANSMISSION SYSTEM SUBMITTED BY SOME STATES FOR THEIR NETWORK AUGMENTATION

Some states have submitted their Intra-State Perspective Plan upto the period 2021-22. The data have been compiled and summary is placed below for the additional ckm and MVA capacity at 765, 400 and 220kV to be added upto 2021-22 in Intra-STS. The details of the name of the transmission schemes to be added in the Intra-STS network at 400kV and above voltage levels are compiled at Annex - 7.4, these, however, need to be firmed up through coordinated planning process.

Region	State	Transmission Lines									Substations								
		765 kV (Existing) (upto Mar 17) (ckm)	765 Kv Addition between (17-22) (ckm)	765 kV proposed (upto Mar 22) (ckm)	400 kV (Existing) (upto Mar 17) (ckm)	400 Kv Addition between (17-22) (ckm)	400 kV proposed (upto Mar 22) (ckm)	220 kV (Existing) (upto Mar 17) (ckm)	220 Kv Addition between (17-22) (ckm)	220 kV proposed (upto Mar 22) (ckm)	765 kV (Existing) (upto Mar 17) (MVA)	765 Kv Addition between (17-22) (MVA)	765 kV proposed (upto Mar 22) (MVA)	400 kV (Existing) (upto Mar 17) (MVA)	400 Kv Addition between (17-22) (MVA)	400 kV proposed (upto Mar 22) (MVA)	220 kV (Existing) (upto Mar 17) (MVA)	220 Kv Addition between (17-22) (MVA)	220 kV proposed (upto Mar 22) (MVA)
NR	Punjab	0	0	0	1583.594	0	1583.594	8151.427	460	8611.427	0	0	0	4890	1000	5890	26414	5547.5	31961.5
	Haryana	0	0	0	49	10	59	322.1	838.75	1160.85	0	0	0	630	2945	3575	5069	11385	16454
	Delhi	0	0	0	0	150	150	80.2	456	536.2	0	0	0	315	3315	3630	1260	6460	7720
	Himachal Pradesh					39			589						1575			1609.5	
	Uttar Pradesh		1000			1305						6000			9780				
	Jammu and Kashmir	Data Not Submitted																	
	Chandigarh	Data Not Submitted																	
	Uttarakhand	Data Not Submitted																	
WR	Chhattisgarh	0	0	0	1920.4	186	2106.4	3432.22	1201.78	4634	0	0	0	1575	1890	3465	6190	4480	10670
	Gujarat	0	0	0	4705	5150	9855	18406	5311	23717	0	0	0	15450	18500	33950	32110	20460	52570
	Madhya Pradesh	0	0	0	3554.45	1206	4760.45	12425.86	3017.6	15443.46	0	0	0	7980	4295	12275	21930	5640	27570
	Rajasthan	Data Not Submitted																	
	Goa	Data Not Submitted																	
	Maharastra	Data Not Submitted																	
	Daman and Diu	Data Not Submitted																	
	Dadra and Nagar Haveli	Data Not Submitted																	

Region	State	Transmission Lines									Substations								
		765 kV (Existing) (upto Mar 17) (ckm)	765 Kv Addition between (17-22) (ckm)	765 kV proposed (upto Mar 22) (ckm)	400 kV (Existing) (upto Mar 17) (ckm)	400 Kv Addition between (17-22) (ckm)	400 kV proposed (upto Mar 22) (ckm)	220 kV (Existing) (upto Mar 17) (ckm)	220 Kv Addition between (17-22) (ckm)	220 kV proposed (upto Mar 22) (ckm)	765 kV (Existing) (upto Mar 17) (MVA)	765 Kv Addition between (17-22) (MVA)	765 kV proposed (upto Mar 22) (MVA)	400 kV (Existing) (upto Mar 17) (MVA)	400 Kv Addition between (17-22) (MVA)	400 kV proposed (upto Mar 22) (MVA)	220 kV (Existing) (upto Mar 17) (MVA)	220 Kv Addition between (17-22) (MVA)	220 kV proposed (upto Mar 22) (MVA)
SR	Telangana	0	0	0	3838.35	3916	7754.35	6783.41	1148	7931.41	0	0	0	8905	20225	29130	17266	6300	23566
	Tamil Nadu	0	700	700	1246	2073.8	3319.8	1740	1179.3	2919.3	0	13500	13500	10955	12705	23660	3957	8602	12559
	Kerala	0	0	0	0	786	786	131	1796.8	1927.8	0	0	0	315	2890	3205	1320	6470	7790
	Andhra Pradesh	0	0	0	2279.34	2411	4690.34	1626.44	2451	4077.44	0	0	0	5965	14370	20335	3227.5	8170	11397.5
	Karnataka	0	0	0	360	1494.94	1854.94	780.18	2007.95	2788.13	0	0	0	0	9630	9630	1600	5100	6700
	Puducherry	0	0	0	0	0	0	0	70	70	0	0	0	0	0	0	0	480	480
	Lakshadweep	Data Not Submitted																	
ER	Bihar	0	0	0	0	390	390	3158	1168	4326	0	0	0	0	7945	7945	4340	7440	11780
	Odisha	0	324	324	1038	895	1933	6887	1803	8690	0	3000	3000	2205	5945	8150	8610	4800	13410
	West Bengal	0	0	0	2353	363	2716	3568	881	4449	0	0	0	5355	3205	8560	12340	5870	18210
	Jharkhand	0	0	0	180	240	420	1295	720.814	2015.814	0	0	0	0	1560	1560	2100	2300	4400
	Sikkim	0	0	0	0	0	0	0	93	93	0	0	0	0	0	0	0	200	200
	Andaman and Nicobar Islands	Data Not Submitted																	
NER	Tripura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Manipur	0	0	0	0	45.1	45.1	0	0	0	0	0	0	0	315	315	0	0	0
	Assam	0	0	0	7.2	50	57.2	1819.298	1407.602	3226.9	0	0	0	630	1630	2260	2290	4180	6470
	Nagaland	0	0	0	0	0	0	161	0	161	0	0	0	0	0	0	100	0	100
	Meghalaya	0	0	0	4.428	0	4.428	226.84	244	470.84	0	0	0	630	0	630	520	640	1160
	Arunachal Pradesh	Data Not Submitted																	
	Mizoram	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	**0**	**2024**	**1024**	**23118.76**	**20710.84**	**42485.6**	**70993.98**	**26844.6**	**97249.57**	**0**	**22500**	**16500**	**65800**	**123720**	**178165**	**150643.5**	**116134**	**265168**

7.8 EXPECTED TRANSMISSION SYSTEM ADDITION DURING 13TH PLAN (i.e. 2017 – 22)

Based on the analysis as mentioned in this report, 100000 CKM of transmission lines and 200000 MVA of transformation capacity of the substations at 220kV and above voltage levels is expected to be added during 13th Plan period. The growth of 220kV and above transmission system from 10th Plan to 13th Plan period is as given below:

Transmission System Type / Voltage Class	Unit	At the end of 10th Plan (Mar. 2007)	At the end of 11th Plan (Mar. 2012)	Expected at the end of 12th Plan	Expected to be added during 13th Plan	Expected (commulative) at the end of 13th Plan
TRANSMISSION LINES						
(a) HVDC ± 500kV/800 kV Bipole	Ckm	5872	9432	15535	4280	19815
(b) 765 kV	Ckm	2184	5250	29431	27300	56731
(c) 400 kV	Ckm	75722	106819	157644	46000	203644
(d) 230/220kV	Ckm	114629	135980	162325	28000	190325
Total–Transmission Lines	**Ckm**	**198407**	**257481**	**364935**	**105580**	**470515**
SUBSTATIONS						
(a) 765 kV	MVA	0	25000	155000	114000	269000
(b) 400 kV	MVA	92942	151027	234372	103000	337372
(c) 230/220 kV	MVA	156497	223774	298265	75000	373265
Total – Substations	***MVA***	**249439**	**399801**	**687637**	**292000**	**979637**
HVDC						
(a)Bi-pole link capacity	MW	5000	6750	13500	14000	27500
(b) Back-to back capacity	MW	3000	3000	3000	0	3000
Total of (a), (b)	**MW**	**8000**	**9750**	**16500**	**14000**	**30500**

7.9 COST ESTIMATE FOR TRANSMISSION SYSTEM DURING 2017-22

It is estimated that an expenditure of Rupees 2,60,000 crore would be carried out during 13th Plan period for implementation of transmission system addition required in the country. This also includes an estimate of Rupees 30,000 crore in transmission system at below 220kV voltage level.

Annex – 7.1

INTER-REGIONAL TRANSMISSION LINKS AND CAPACITY (MW)

	Present (as on Nov 2016)	Addition in rest of 12th Plan	Capacity expected at the End of 12th Plan	Likely addition during 13th Plan	Capacity expected at the End of 13th Plan
EAST-NORTH					
Dehri-Sahupuri 220 kV S/c	130		130		130
Sasaram HVDC back-to-back	500		500		500
Muzaffarpur-Gorakhpur 400 kV D/c (with Series Cap+TCSC)	2000		2000		2000
Patna – Balia 400kV D/c (Quad)	1600		1600		1600
Biharshariff – Balia 400kV D/c(Quad)	1600		1600		1600
Barh – Balia 400kV D/c (Quad)	1600		1600		1600
Gaya - Balia 765kV S/c	2100		2100		2100
Sasaram bypassing(additional capacity)	500		500		500
Sasaram - Fatehpur 765kV S/c	2100		2100		2100
Barh-II-Gorakhpur 400kV D/c (Quad) line	1600		1600		1600
Gaya-Varanasi 765 kV 2xS/c line	4200		4200		4200
Biharsharif-Varanasi 400kV D/c line (Quad)	1600	0	1600		1600
LILO of Biswanath Chariali - Agra +/- 800 kV, 3000 MW HVDC Bi-pole at new pooling station in Alipurduar and addition of second 3000 MW module		1500	1500	1500	3000
Sub-total	**19530**	**1500**	**21030**	**1500**	**22530**
EAST-WEST					
Budhipadar-Korba 220 kV 3 ckts.	390		390		390
Rourkela-Raipur 400 kV D/c with series comp.+TCSC	1400		1400		1400
Ranchi –Sipat 400 kV D/c with series comp.	1200		1200		1200

Rourkela-Raipur 400 kV D/c (2nd) with series comp.	1400		1400		1400
Ranchi - Dharamjayagarh - WR Pooiling Station 765kV S/c line	2100		2100		2100
Ranchi - Dharamjaygarh 765kV 2nd S/c	2100		2100		2100
Jharsuguda-Dharamjaygarh 765kV D/c line	4200		4200		4200
Jharsuguda-Dharamjaygarh 765kV 2nd D/c line				4200	4200
Jharsuguda - Raipur Pool 765kV D/c line			0	4200	4200
Sub-total	**12790**	**0**	**12790**	**8400**	**21190**
WEST- NORTH					
Auriya-Malanpur 220 KV D/c	260		260		260
Kota - Ujjain 220 KV D/c	260		260		260
Vindhyachal HVDC back-to-back	500		500		500
Gwalier-Agra 765 kV 2 x S/c	4200		4200		4200
Zerda-Kankroli 400kV D/c	1000		1000		1000
Gwalior-Jaipur 765kV 2xS/c lines	4200		4200		4200
Adani(Mundra) - Mahendranagar HVDC bipole	2500		2500		2500
RAPP-Sujalpur 400kV D/c	1000		1000		1000
Champa Pool- Kurukshetra HVDC Bipole		3000	3000		3000
Upgradation of Champa Pool-Kurukshetra HVDC Bipole				3000	3000
Jabalpur - Orai 765kV D/c line				4200	4200
LILO of Satna - Gwalior 765kV S/c line at Orai				4200	4200
Banaskantha-Chittorgarh 765kV D/c line				4200	4200
Vindhyachal-Varanasi 765kV D/c line				4200	4200
Sub-total	**13920**	**3000**	**16920**	**19800**	**36720**
EAST- SOUTH					
Balimela-Upper Sileru 220kV S/c	130		130		130
Gazuwaka HVDC back-to-back	1000		1000		1000
Talcher-Kolar HVDC bipole	2000		2000		2000
Upgradation of Talcher-Kolar HVDC Bipole	500		500		500

Angul - Srikakulum		4200	4200		4200
Sub-total	**3630**	**4200**	**7830**		**7830**
WEST- SOUTH					
Chandrapur HVDC back-to-back	1000		1000		1000
Kolhapur-Belgaum 220kV D/c	260		260		260
Ponda – Nagajhari 220kV D/c	260		260		260
Raichur - Sholapur 765kV S/c line (PG)	2100		2100		2100
Raichur - Sholapur 765kV S/c line (Pvt. Sector)	2100		2100		2100
Narendra - Kolhapur 765kV D/c (ch at 400kV)	2200		2200		2200
Wardha - Hyderabad 765kV D/c line				4200	4200
Warora Pool - Warangal (New) 765kV D/c line				4200	4200
Raigarh-Pugulur HVDC line				6000	6000
LILO of Narendra-Narendra(New) 400kV (quad) line at Xeldam (Goa)				1600	1600
Sub-total	**7920**	**0**	**7920**	**16000**	**23920**
EAST- NORTH EAST					
Birpara-Salakati 220kV D/c	260		260		260
Malda - Bongaigaon 400 kV D/c	1000		1000		1000
Siliguri - Bongaigaon 400 kV D/c (Quad) line	1600		1600		1600
Sub-total	**2860**	**0**	**2860**		**2860**
NORTH EAST-NORTH					
Biswanath Chariali - Agra +/- 800 kV, 3000 MW HVDC Bi-pole$	3000	0	3000		3000
Sub-total	**3000**	**0**	**3000**		**3000**
TOTAL	**63,650**	**8,700**	**72,350**	**45,700**	**1,18,050**

Annex – 7.2

Transmission System for period up to end of 13th Plan

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
ER - 1	**Eastern Region Strengthening Scheme-V**			
	1. Establishment of 400/220 kV, 2X500 MVA Rajarhat substation	400/220kV	trf	UC
	2. LILO of Subhashgram- Jeerat 400kV S/C line at Rajarhat	400kV	D/C	UC
	3. Rajarhat-Purnea 400 kV D/c line (triple snowbird), with LILO of one circuit at Gokarna and other circuit at Farakka	400kV	D/C	UC
ER - 2	**Eastern Region System Strengthening Scheme - VI**			
	1. LILO of Barh - Gorakhpur 400 kV D/c line at Motihari (2xD/c) (quad)	400kV	2xD/C	UC
	2. Mujaffarpur - Darbhanga 400 kV D/c line with triple snow bird conductor	400kV	D/C	UC
	3. 2x500 MVA 400 / 220 kV S/s at Darbhanga (GIS) with space for future extension	400/220kV	trf	UC
	4. 2x200 MVA 400 / 132 kV S/s at Motihari (GIS) with space for future extension	400/132kV	trf	UC
	5. 2x80 MVAR Line reactors (switchable) at Motihari end (with 600 ohm NGR) for Barh-Mothihari section		Reactor	UC
	6. 2x50 MVAR Line reactors (fixed) at Mothihari end (with 400 ohm NGR) for Mothihari - Gorakhpur section		Reactor	UC
ER - 3	**ATS for New Nabi Nagar JV (Bihar+NTPC) (1980MW)**			
	1. Nabinagar-Gaya 400kV D/C (Quad) line	400kV	D/C	UC
	2. Nabinagar-Patna 400kV D/C (Quad) line	400kV	D/C	UC
	3. Augumentation of Gaya 765/400kV 1x1500 MVA Transformer.	765/400kV	trf	UC
ER - 4	**Dedicated Transmission line for Essar Power (1200 MW).**			
	Essar Power - Jharkhand Pooling station 400kV Quad D/C line	400kV	D/C	UC
ER - 5	**Dedicated Transmission System for Phase-I Generation Projects in Orissa[Sterlite TPP U 1&2, 3&4 (2400 MW), Monet Power (1050 MW), GMR(1050 MW), Nav Bharat (1050 MW), Ind Barat(700 MW), Jindal (1200MW), Lanco Babandh(4x660), Derang TPP (2x600 MW)]**			
	Dedicated Transmission line for Sterlite TPP U 1&2, 3&4(2400MW)			
	Sterlite TPP - Jhasuguda 765/400kV Pooling station 2XD/c 400kV line	400kV	2xD/C	UC
	Dedicated Transmission line for Nav Bharat (1050 MW)			
	Navbharat TPP - Angul Pooling point 400 kV D/C(Quad) line	400kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Dedicated Transmission line for Lanco Babandh(4x660MW)			
	Lanco-Angul Pooling point 400 kV 2xD/c line	400kV	2xD/C	UC
ER - 6	**Dedicated Transmission System for Phase-I Generation Projects in Sikkim[Teesta – III HEP(1200MW), Teesta-VI(500 MW), Rangit-IV (120 MW), Chujachen (99MW), Bhasmey (51 MW), Jorethang Loop(96 MW), Rongnichu(96 MW)]**			
	Dedicated Transmission line for Teesta – III HEP(1200MW)			
	Teesta-III – Kishanganj 400kV D/c line with Quad Moose conductor	400kV	D/C	UC
	Dedicated Transmission line for Rongnichu(96 MW)			
	Rongnichu-Rangpo 220 kV D/c line	220kV	D/C	UC
ER - 7	**ATS for Raghunathpur (1200MW)**			
	Raghunathpur-Ranchi 400kV quad D/C line	400kV	D/C	UC
ER - 8	**Eastern Region System Strengening Scheme - XII**			
	1. Installation of 1X125 MVAR Bus Reactor at Baripada with GIS bay.	400kV	Reactor	UC
	2. Installation of 1X125 MVAR Bus Reactor at Maithon with GIS bay	400kV	Reactor	UC
	3. Replacement of 2X315 MVA, 400/220 kV ICTs with 2X500 MVA, 400/220 kV ICTs at Purnea #	400/220kV	trf	UC
	4. Replacement of 2X315 MVA, 400/220 kV ICTs with 2X500 MVA, 400/220 kV ICTs at Patna #	400/220kV	trf	UC
	5. Replacement of 2X315 MVA, 400/220 kV ICTs with 2X500 MVA, 400/220 kV ICTs at Pusauli #	400/220kV	trf	UC
	6. Shifting of 1X315 MVA, 400/220 kV ICT from any suitable location (after replacement by 1x500MVA ICT) and install it at Jamshedpur 400/220 kV Substation as 3rd ICT alongwith associated bays.	400/220kV	Replacement	UC
	7. Procurement of two 500 MVA, Single Phase unit of 765/400 kV ICT for Eastern Region to be stationed at Angul and Jharsuguda sub-station	765/400kV	trf	UC
	8. Spare 1 unit of 765kV, 110 MVAR Single Phase Reactor to be stationed at Sasaram	765kV	Reactor	UC
	9. Modification of 132kV bus arrangement at 220/132kV Siliguri Substation with GIS	132kV		UC
ER - 9	**Transmission System assocoiated with Darlipalli TPS**			
	1. Darlipalli TPS – Jharsuguda P.S. 765kV D/c line	765kV	D/C	UC
ER - 10	**ATS for Phunatsangchu St-I (1200 MW)**			
	1. Punatsangchu I - Lhamoizingkha (Bhutan Border) 400 kV 2xD/c line	400kV	2xD/C	UC
	2. Lhamoizingkha (Bhutan Border) – Alipurduar 400kV D/C with Quad Moose Conductor	400kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	3. LILO of 220 kV Bosochhu-II-Tsirang S/c line at Punatsangchu-I	220kV	D/C	UC
ER -	4. 3x105 MVA ICT at Punatsangchu		trf	UC
ER -	5. 1x80 MVAR Bus reactor at Punatsangchu		Reacto r	UC
ER - 11	**ATS for Punatsangchu St-II (990 MW)**			
	1. LILO of Punatsangchu I - Lhamoizingkha (Bhutan Border) 400 kV D/c line at Punatsangchu-II	400kV	D/C	Planned
ER - 12	**Indian Grid Strengthening for import of Bhutan surplus**			
	1. New 2x315 MVA ,400/220kV AC & HVDC S/S with ±800kV, 3000MW converter module at Alipurduar.	400/220k V	trf	UC
	2. New Alipurdwar & Extension of ±800 kV HVDC station with 3000 MW inverter module at Agra	±800kV	HVDC	UC
	3. LILO of ±800kV,6000MW Bishwanath Chariyali – Agra HVDC Bi-pole line at Alipurduar for parallel operation HVDC terminal with 400/220kV at Alipurduar	±800kV	HVDC	UC
	4. LILO of Bongaigaon – Siliguri 400kV D/C Quad Moose line at Alipurduar	400kV	2xD/C	UC
	5. Lhamoizingha/Sunkosh –Alipurduar 400kV D/C (1st) Quad moose line (Indian portion)	400kV	2xD/C	UC
	8. Earth electrode line at Alipurduar HVDC terminal			UC
	9. Earth electrode line at Agra HVDC terminal			UC
ER - 13	**Indian Grid Strengthening for import of Bhutan surplus**			
	Jigmeling (Bhutan) - Alipurduar 400kV D/c (Quad/HTLS)	400kV	D/c	Planned
	Alipurduar – Siliguri 400kV D/c line with Quad moose conductor	400kV	D/c	Planned
	Kishanganj – Darbhanga 400kV D/c line with Quad moose conductor	400kV	D/c	Planned
ER - 14	**Dynamic Reactive Compenstion in Eastern Region - XI**			
	1. At Rourkela. 2x125 MVAR MSR & +/- 300 MVAR STATCOM	400kV	reactor / capacit or	UC
	2. At Ranchi. 2x125 MVAR MSR & +/- 300 MVAR STATCOM	400kV	reactor / capacit or	UC
	3. At Kishanganj. 2x125 MVAR MSR & +/- 300 MVAR STATCOM	400kV	reactor / capacit or	UC
	4. At Jeypore. 2x125 MVAR MSR, 1x125 MVAR MSC & +/- 300 MVAR STATCOM	400kV	reactor / capacit or	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Additional Reactive Compensation in Eastern Region: Addition of additional 1x125MVAr Bus reactors at Banka, Bolangir, Baripada, Keonjhar, Durgapur, Chaibasa and Lakhisarai (Eastern Region Strengthening Scheme-XIV)	400kV	Reactor	UC
ER - 15	**Transformer Augmentation/Replacements in Eastern Region**			
	Augmentation of Transformation capacity at 400/220kV Baripada S/S (PG): Addition of 1x500MVA Transformer	400/220kV	trf	UC
ER - 16	**765kV strengthening system in Eastern Region (Eastern Region Strengthening Scheme-XVIII)**			
	1. Establishment of 765/400 kV new substations at Medinipur and, Jeerat (New).	765/400kV	trf	Planned
	2. Ranchi (New) – Medinipur 765kV D/c line	765kV	D/C	Planned
	3. Medinipur – Jeerat (New) 765kV D/c line	765kV	D/C	Planned
	5. LILO of Chandithala – Kharagpur 400kV D/c line at Medinipur	400kV	D/C	Planned
	6. Jeerat (New) – Subhasgram 400kV D/c line(quad)	400kV	D/C	Planned
	7. Jeerat (New) – Jeerat 400kV D/c line (quad)	400kV	D/C	Planned
	8. LILO of Jeerat – Subhasgram 400kV S/c line at Rajarhat	400kV	S/C	Planned
ER - 17	**Dedicated Transmission System for Phase-II Generation Projects in Sikkim[Dikchu(96 MW), Panan(300 MW), Ting Ting(99 MW), Tashiding(97 MW)]**			
	Dedicated Transmission line for Ting Ting(99 MW)			
	Tingting- Tashiding PS 220kV D/C line	220kV	D/C	Planned
	Immediate Evacuation System (under the scope of Generation Developer)			
	Tashiding - Legship 220kV D/c line	220kV	D/C	Planned
ER - 18	**ATS for Phase-II Generation Projects in Sikkim[Dikchu(96 MW), Panan(300 MW), Ting Ting(99 MW), Tashiding(97 MW)]-Part-B**			
ER - 19	**Reconductoring of Overloaded Lines in Eastern Region**			
	2. Maithon RB - Maithon 400kV D/c line	400kV	D/C	New
ER - 20	**ATS for Katwa TPS (2x660 MW)**			
	Katwa TPS - Katwa New 400kV D/c Quad	400kV	D/C	New
ER - 21	**ATS for Turga PSS (4x250 MW)**			
	Turga PSS - Purulia New 400kV D/c Quad	400kV	D/C	New
ER - 22	**Transmission System for Phase-II IPPs in Odisha**			
	OPGC – Jharsuguda 400 kV D/c (Triple Snowbird)	400kV	D/C	Planned
	Jharsuguda – Raipur Pool 765 kV D/c line	765kV	D/C	Planned
	Addition of 2x1500MVA, 765/400kV ICT at Jharsuguda	765/400kV	trf	Planned
	Addition of 2x1500MVA, 765/400kV ICT at Angul	765/400kV	trf	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Split bus arrangement at 400kV and 765kV bus in both Angul and Jharsuguda substations			Planned
ER - 23	**Eastern Region Strengthening Scheme –XV**			
	1. Farakka – Baharampur 400kV D/C (Twin HTLS) line	400kV	D/C	Planned
	2. Removal of the existing LILO of Farakka – Jeerat S/c line at Baharampur	400kV	S/C	Planned
	3. LILO of Farakka – Jeerat 400 kV S/c line at Sagardighi	400kV	S/C	Planned
	4. LILO of Sagardighi – Subhasgram 400 kV S/c line at Jeerat	400kV	S/C	Planned
ER - 24	**Eastern Region Strengthening Scheme –XVII (PART-A)**			
	2x160MVA, 220/132kV ICT at Daltonganj substation	220/132kV	trf	Planned
ER - 25	**Eastern Region Strengthening Scheme –XVII (PART-B)**			
	1. Installation of 3rd 400/220 kV, 1x315 MVA ICT at Durgapur Substation	400/220kV	trf	Planned
	2. Replacement of 400/220 kV, 2x315MVA ICTs at Malda Substation with 400/220kV, 2x500 MVA ICTs	400/220kV	trf	Planned
	3. Installation of 3rd 400/220 kV, 1x315MVA ICT at New Siliguri Substation	400/220kV	trf	Planned
	4. Replacement of 400/220 kV, 2x315MVA ICTs at Jeypore Substation with 400/220 kV, 2x500MVA ICTs	400/220kV	trf	Planned
	5. Replacement of 400/220 kV, 2x315MVA ICTs at Rourkela Substation with 400/220 kV, 2x500MVA ICTs	400/220kV	trf	Planned
	6. Installation of 400/220 kV, 1x500 MVA ICT at Gaya Substation	400/220kV	trf	Planned
ER - 26	**Eastern Region Strengthening Scheme –XIX**			
	1. 400/220kV, 2x500MVA ICT new substation at Dhanbad (Jharkhand)	400/220kV	trf	Planned
	2. LILO of both circuits of Ranchi – Maithon-RB 400kV D/c line at Dhanbad	400kV	D/C	Planned
ER - 27	**Immediate evacuation for North Karanpura (3x660MW) generation project of NTPC**			
	North Karanpura – Gaya 400 kV D/c with quad moose conductor	400kV	D/C	Planned
	North Karanpura – Chandwa (Jharkhand) Pooling Station400 kV D/c with quad moose conductor	400kV	D/C	Planned
ER - 28	**Manhdhechu (720 MW)**			
	1. Mangdechu HEP-Goling 400kV 2XS/c line	400kV	2xS/c	Planned
	2. Goling-Jigmeling 400kV D/c line	400kV	D/c	Planned
	3. Jigmeling-Alipurduar 400kV D/c line(Quad)	400kV	D/c	Planned
NER - 1	**ATS for Pare Dikrong HEP (110MW)**			
	1. LILO of RHEP-Nirjouli 132kV S/c line at Dikrong HEP	132kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	2. LILO of one ckt of RHEP-Itanagar 132kV D/c line at Dikrong HEP	132kV	D/C	UC
NER - 2	**ATS for Kameng HEP (600MW)**			
	1. Kameng-Balipara 400kV D/c line	400kV	D/C	UC
NER - 3	**ATS for Lower Subansiri HEP (2000MW)**			
	1. Lower-Subansiri-Biswanath Chariyali(PP) 400 kV 2xD/C (Twin Lapwing) line	400kV	2xD/C	UC
NER - 4	**Combined ATS for Pallatana (726 MW) & Bongaigaon TPP(750MW)**			
	1. Melriat (New)-Melriat (Mizoram) 132kV D/c line	132kV	D/C	UC
	2. Silchar-Hailakandi (AEGCL) 132kV D/c line	132kV	D/C	UC
	3. Passighat-Roing 132kV S/c on D/c line	132kV	S/C on D/C	UC
	4. Roing-Tezu 132kV S/c on D/c line	132kV	S/C on D/C	UC
	5. Tezu-Namsai 132 kV S/c on D/c line	132kV	S/C on D/C	UC
	6. Establishment of Roing 132/33kV S/S (single phase 7x5 MVA one spare)	132/33kV	trf	UC
	7. Establishment of Tezu 132/33 S/S (single phase 7x5 MVA one spare)	132/33kV	trf	UC
	8. Establishment of Namsai 132kV S/S (2x15 MVA)	132/33kV	trf	UC
NER - 5	**NER System Strengthening-II**			
	1. Biswanath Chariyali – Itanagar (Ar. Pradesh) 132 kV D/c line (Zebra Conductor)	132kV	D/C	Planned
	2. Silchar – Misa 400 kV D/c (quad) line.	400kV	D/C	Planned
	5. 80 MVAR Bus Reactor at Misa (PG)	400kV	trf	Planned
NER - 6	**Dedicated sysyem for Patel Hydro, Nafra,**			
	Dedicated System for Patel Hydro (Gongri+Sasankrong)			
	Saskngrong - Goongri 132kV D/c lline	132kV	D/C	Planned
	Goongri - Dinchang PP 220kV D/C line		D/C	Planned
	Dedicated System for SEW Nafra			
	Nafra - Dinchang PP 220kV D/C line	220kV	D/C	Planned
NER - 7	**Dedicated sysyem for Patel Hydro, Nafra,**			
	1. 440/220kV ,2x315 MVA Pooling station at Rangia/ Rowta	400/220kV		Planned
	2. 440/220kV ,2x315 MVA Pooling station at Dinchang	400/220kV		Planned
	3. LILO of Bongaigaon – Balipara 400kV D/C line at rangia/Rowta	400kV	2xD/C	Planned
	4. Dinchang PP –Rangia/ Rowta 400kV D/C (quad) line	400kV	D/C	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
NER - 8	**NER System Strengthening-III**			
	Installation of 2nd 400/220 kV, 315 MVA ICT at Bongaigaon substation	400/220kV	trf	UC
	Replacement of existing 60MVA, 220/132kV ICT by 1x160 MVA 220/132 kV ICT at Kopili HEP	220/132kV	trf	UC
	Replacement of existing 2x50MVA, 220/132kV ICTs by 2x160MVA, 220/132kV ICTs at Balipara sub-station	220/132kV	trf	UC
NER - 9	**NER System Strengthening-IV**			
	1. Addition of 2x500 MVA, 400/200 kV ICT with GIS bays in the space vacated after removal of 4x105 MVA, 400/220 kV ICT at Misa sub-station of POWERGRID	400/220kV	trf	Planned
	2. 1x125 MVAR, 420kV bus reactor at Balipara (POWERGRID) sub-station	400kV	Reactor	Planned
	3. 1x125 MVAR, 420kV bus reactor at Bongaigaon (POWERGRID) sub-station	400kV	Reactor	Planned
	4. 2x315 MVA (7x105MVA single phase units), 400/132 kV ICTs at Imphal	400/132kV	trf	Planned
NER - 10	**NER System Strengthening-V**			
	1. Establishment of 2x315 MVA 400/132 kV S/s at Surajmaninagar	400/132kV	trf	Planned
	2. Establishment of 2x315 MVA 400/132 kV S/s at P.K.Bari	400/132kV	trf	Planned
	3. Surajmaninagar - P.K.Bari 400 kV D/c line	400kV	D/C	Planned
	4. AGTPP – P.K.Bari 132kV D/c line with high capacity HTLS conductor	132kV	D/C	Planned
NER - 11	**NER System Strengthening-VI**			Planned
	1. Establishment of 2x500 MVA 400/220 kV S/S at New Kohima along with 4 no. 400 kV line bays, 2x125 MVAr bus reactor	400/220kV	trf	Planned
	2. Imphal – New Kohima 400 kV D/C line	400kV	D/C	Planned
	3. New Kohima – New Mariani 400kV D/c line	400kV	D/C	Planned
	4. 1x125 MVAR bus reactor (2nd) at Imphal (PG)	400kV	Reactor	Planned
	5. Up-gradation of New Mariani substation to 400/220 kV with 2x500MVA transformer	400/220kV	trf	Planned
NER - 12	**NER System Strengthening-VII**			Planned
	1. Reconductoring of Imphal (POWERGRID) - Yurembam (State) 132 kV S/c line	132kV	S/c	Planned
	2. Installation of 400/132kV, 1x315MVA ICT (3rd) at Silchar S/s along with associated bays in GIS	400/132kV	trf	Planned
	3. 220kV, 1x31.5MVAr bus reactor at Mokukchung (POWERGRID) S/s	220kV	Reactor	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
NR - 1	**System Strengthening in Northern Region for SASAN & MUNDRA (UMPP)**			
	400KV D/C Sikar - Jaipur line	400kV	D/c	UC
NR - 2	**Creation of 400/220KV S/Stn. in NCT of Delhi during 12th Plan Period (Part-A)**			
	LILO of both ckt of Bawana - Mandola 400KV D/C line at Rajghat (Multi Ckt tower with twin/HTLS Cond.)	400kV	D/c	UC
	LILO of one ckt of Bamnauli - Jattikalan 400KV D/C line at Dwarka-I (with twin/HTLS Cond.)	400kV	D/c	UC
NR - 3	**Creation of 400/220KV S/Stn. in NCT of Delhi during 12th Plan Period (Part-B1)**			
	LILO of both ckt of Bamnauli - Samaypur 400KV D/C line at Tughlakabad (with twin HTLS Cond.)	400kV	D/c	UC
NR - 4	**Transmission System Associated with RAPP 7 & 8 - Part - B.**			
	400KV D/C Kota - Jaipur (South) line (part of RAPP-Jaipur (S) 400KV D/C line with one ckt LILO at Kota).	400kV	D/c	UC
NR - 5	**NR System Strengthening Scheme-XXIV**			
	1. Dehradun – Abdullapur 400 kV D/c (Quad)	400kV	D/C	UC
	2. Dulhasti – Kishenpur 400 kV D/c (Quad) – Single Circuit Strung	400kV	S/C	UC
NR - 6	**NR System Strengthening Scheme-XXV**			
	1. Jaipur-Bhiwani 765kV S/c (2nd Ckt)	765kV	S/C	UC
NR - 7	**ATS for Kishen Ganga (330MW)**			
	1. Kishenganga – Wagoora 220kV D/c line	220kV	D/C	UC
	3. Kishenganga- Amargarh 220kV D/c line	220kV	D/C	UC
NR - 8	**ATS for Baghlihar II (450 MW)**			
	LILO of one ckt of 400kV Kishenpur-New Wanpoh D/c line at Baghlihar HEP	400kV	D/C	Planned
NR - 9	**ATS for Parbati-II (800MW)**			
	1 Parbati II-Koldam (Quad) 1st ckt	400kV	S/C	UC
	2 Parbati II-Koldam (Quad) 2nd ckt	400kV	S/C	UC
	3 Parbati II- Koldam (Quad) D/c portion	400kV	D/C	UC
NR - 10	**ATS for Koldam (800MW)**			
	1) Koldam-Ludhiana 400kV D/c	400kV	D/C	UC
NR - 11	**Transmission System Associated with RAPP 7 & 8 - Part-A.**			
	400KV D/C RAPP - Kota line	400kV	D/C	UC
NR - 12	**Combined ATS for Rihand STPP-III (2X500 MW) & Vindhyachal STPP -IV (2X500 MW) of WR**			
	1. Vindhyachal Pool-Sasan 765 KV S/c	765kV	S/C	UC
	2. Establishment of 765/400kV, 2x1500 MVA S/s at Vindhyachal Pool	765/400kV	trf	UC
NR - 13	**SVCs in Northern Region**			
	1. Ludhiana S/s - (+) 600 MVAR / (-) 400 MVAR	400kV	SVC	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	2. Kankroli S/s - (+) 400 MVAR / (-)300 MVAR	400kV	SVC	UC
	3. New Wanpoh S/s - (+) 300 MVAR / (-) 200 MVAR	400kV	SVC	UC
NR - 14	**ATS for Tehri-II (1000MW)**			
	1. Tehri PSP – Tehri Pooling Point (quad) 400kV S/c line	400kV	S/C	UC
	2. Charging Tehri Pooling Point – Meerut line at 765kV 2xS/c line	765kV	S/C	UC
	3. Establishment of 765/400 kV, 4x800 MVA S/S at Tehri Pool (Due to Space constraints, Tehri Pooling stn. would be GIS)	765/400kV	trf	UC
	4. 765/400 kV, 1x1500 MVA substations at Meerut	765/400kV	trf	UC
	5. Modification of Series Capacitors for operation at 765 kV level at meerut	765kV		UC
NR - 15	**Dynamic Compensation (STATCOM) at Lucknow and Nalagarh**			
	1. At Lucknow. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 300 MVAR STATCOM	400kV	STATCOM	UC
	2. At Nalagarh 2x125 MVAR MSR, 2X125 MVAR MSC & +/- 200 MVAR STATCOM	400kV	STATCOM	UC
NR - 16	**NR System Strengthening Scheme-XXIX**			
	1. LILO of both circuits of Uri - Wagoora 400 kV D/c line at Amargarh (on multi-circuit towers)	400kV	2xD/C	UC
	2. Establishment of 7x105 MVA (1ph units.), with 400/220 kV GIS substation at Amargarh	400/220kV	trf	UC
	3. Jullandhar – Samba 400 kV D/c line	400kV	D/C	UC
	4. Samba -Amargarh 400 kV D/c line	400kV	D/C	UC
NR - 17	**NR System Strengthening Scheme-XXXI (Part-A)**			
	1. Establishment of a 7XI05MVA, 400/220 kV GIS substation at Kala Amb	400/220kV	trf	UC
	2. LILO of both circuits of Karcham Wangtoo – Abdullapur 400 kV D/c at Kala Amb	400kV	2XD/C	UC
	3. 40% Series Compensation on 400kV Karcham Wangtoo - Kala Amb quad D/c line at Kala Amb end	400kV	Series Capacitor	UC
NR - 18	**NR System Strengthening Scheme-XXXI (Part-B)**			
	1. Kurukshetra - Malerkotla 400 kV D/c line	400kV	D/C	UC
	2. Malerkotla - Amritsar 400 kV D/c line	400kV	D/C	UC
NR - 19	**NR System Strengthening Scheme-XXXII**			
	Provision of 7x105 MVA, 400/220 kV ICT at Parbati Pooling station along with associated bays and two nos. of 220 kV line bays.	400/220kV	trf	UC
	Augmentation of 400/220kV, transformation capacity by 500MVA ICT(4th)at Sector-72 Gurgaon (PG) Substation	400/220kV	trf	UC
NR - 20	**NR System Strengthening Scheme-XXXIV**			

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	1. LILO of Agra – Bharatpur 220 kV S/c line at Agra (PG) alongwith 2 nos of 220kV line bays at Agra (PG) for termination of these lines.	220kV	D/C	UC
	2. 1X315 MVA, 400/220 kV ICT at Agra (PG) along with associated bay 400kV and 220kV bay for termination of ICT (ICT shall be from the spared ICTs available after replacement of ICTs at Ballabhgarh / Mandaula)	400/220kV	trf	UC
	3. 1x315 MVA, 400/220 kV transformer at 400kV substation Kaithal along with associated bay 400kV and 220kV bay for termination of ICT (spared ICT available after replacement of ICTs at Ballabhgarh / Mandaula S/s shall be installed)	400/220kV	trf	UC
	4. 2 nos., 220kV line bays at Kaithal S/s	220kV	bays	UC
	5. 2 nos. 220 kV line bays at 400/220 kV Bhinmal S/s (POWERGRID)	220kV	bays	UC
	7. LILO of one circuit of 400 kV Parbati Pooling Station – Amritsar D/c line at Jalandhar S/s (PG) along with 2 nos of 400kV line bays at Jallandhar(PG) for termination of these lines	400kV	D/C	UC
NR - 21	**NR System Strengthening Scheme-XXXV**			
	Mohindergarh – Bhiwani 400 kV D/c line	400kV	D/C	UC
NR - 22	**ATS for Tanda (2x660MW)**			
	1. Tanda - Sohawal 400kV D/c (Twin Moose) - 90km	400kV	D/C	Planned
	2. Sohawal - Lucknow (New) (PG) 400kV D/c - (Twin Moose) - 165km	400kV	D/C	Planned
NR - 23	**ATS for Unchahar TPS(1x500MW)**			
	1. Unchahar – Fatehpur 400kV D/C line	400kV	D/C	UC
NR - 24	**ATS for Ratle HEP (850 MW)**			
	1. LILO of Dulhasti-Kishenpur 400 kV D/c (Quad) line at Ratle	400kV	D/C	Planned
	2. Kishenpur-Ratle 400 kv S/c Quad line	400kV	S/C	Planned
NR - 25	**NRSS-XXXVI along with LILO of Neemrana-Sikar 400 kV D/c line at Babai (RVPNL)**			
	1. Koteshwar Pooling Station-Rishikesh 400 kV D/C(HTLS) line	400kV	D/C	Planned
	2. 2 Nos. of bays at 400kV Rishikesh S/s	400kV		Planned
	3. LILO of one Ckt. of 400 kV D/c Sikar (PG) - Neemrana (PG) line at Babai (RRVPNL)	400kV	D/C	Planned
	4. Babai (RRVPNL) - Bhiwani (PG) 400 kV D/C line	400kV	D/C	Planned
	5. 2 Nos. of bays at 400 kV Babai (RRVPNL) substation for LILO of one Ckt. of 400 kV D/c Sikar (PG) - Neemrana (PG) line at Babai (RRVPNL)	400kV	Bays	Planned
	6. 2 Nos. of bays at 400 kV Babai (RRVPNL) substation for Babai (RRVPNL) - Bhiwani (PG) 400 kV D/C line	400kV	Bays	Planned
NR - 26	**Creation of new 400kV GIS Substations in Gurgaon and Palwal area as a part of ISTS**			
	1.Aligarh-Prithla 400kV D/c HTLS line	400kV	D/C	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	2. Prithala- Kadarpur 400 kV D/c HTLS line	400kV	D/C	Planned
	3. Kadarpur-Sohna Road 400 kV D/c HTLS line	400kV	D/C	Planned
	4. LILO of Gurgaon-Manesar 400 kV D/c (Quad) line at Sohna Road S/s	400kV	D/C	Planned
	5. Neemrana (PG)- Dhanonda (HVPNL) 400 kV D/c (HTLS) line**	400kV	D/C	Planned
	6. Creation of 400/220 kV, 2X500 MVA GIS substation at Kadarpur in Gurgaon area	400/220kV		Planned
	7. Creation of 400/220 kV, 2X500 MVA GIS substation at Sohna Road in Gurgaon area	400/220kV		Planned
	8. Creation of 400/220 kV, 2X500 MVA GIS substation at Prithala in Palwal area	400/220kV		Planned
	9. 2 Nos. of 400 kV line bays at 400kV Dhanonda (HVPNL) substation	400kV	Bays	Planned
	10. 125 MVAR Bus Reactor at each Kadarpur, Sohna Road & Prithala S/s.	400kV	Reactor	Planned
	11. 8 Nos. of 220 kV line bays at Kadarpur, Sohna Road & Prithala S/s.	220kV	Bays	Planned
NR - 27	**NRSS –XXXVIII**			
	1. Creation of 400kV level at Aligarh(PG) by adding 2x1500MVA 765/400kV ICT alongwith associated bays	765/400kV		Planned
	2. Two no. of 400kV line bays at Aligarh(PG) 765/400kV Substation for Aligarh-Prithala 400 kV D/c HTLS line		Bays	Planned
	3. Two no. of 400kV line bays at Neemrana(PG) 400/220kV Substation for Neemrana-Dhanonda 400kV D/c HTLS line		Bays	Planned
NR - 28	**NRSS XXXIX**			
	400kV Rajghat – Maharanibagh D/c line with HTLS conductor	400kV	D/c	UC
	Two nos. of 400kV GIS bays each at Rajghat and Maharanibagh	400kV	Bays	UC
NR - 29	**RAPP Unit 7 &8**			
	RAPP Shujalpur 400kV D/c	400kV	D/c	UC
NR - 30	**Green Energy Corridor Part A**			
	Rajasthan(Northern Region)			
	• Ajmer (New)- Ajmer (RVPN) 400kV D/c (Quad)	400kV	D/c	UC
	• Chittorgarh (New)- Chittorgarh (RVPN) 400kV D/c (Quad)	400kV	D/c	UC
	• 2x1500 MVA, 765/400kV S/s at Chittorgarh	765/400kV		UC
	• 2x1500 MVA, 765/400kV S/s at Ajmer (New)	765/400kV		UC
NR - 31	**Green Energy Corridor Part D**			
	Northern Region (Rajasthan):			
	Ajmer (New)-Bikaner (New) 765 kV D/c	765kV	D/c	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Bikaner (New)-Moga (PG) 765 kV D/c	765kV	D/c	Planned
	2x1500 MVA, 765/400 kV sub-station at Bikaner (New)	765/400kV		Planned
	Associated reactive compensation (Bus reactors & line reactors)	765kV		Planned
NR - 32	**Series reactors**			
	Series bus reactors : 400 kV Mandaula substation; 400kV Ballabgarh substation	400kV	Reactor	Planned
	Series Line reactors:- Dadri-Mandaula 400kV Ckt-I & II – 2 Nos	400kV	Reactor	Planned
NR - 33	**Establishment of 220/66kV, 2x160MVA GIS S/s at UT Chandigarh along with 220kV D/c line from Chandigarh to 400/220kV Panchkula(PG)substation**			
	Creation of 2x160MVA, 220/66 kV GIS S/s at UT Chandigarh	220/66kV		Planned
	220kV D/c line from UT, Chandigarh to 400/220kV Panchkula(PG) substation- 56 km	220kV	D/c	Planned
NR - 34	**Augmentation of Transformation Capacity at Mainpuri & Sikar**			
	a) Augmentation of Transformation Capacity at Mainpuri(PG) 400/220kV substation by 1x500 MVA capacity along with associated bays.	400/220kV		Planned
	b) Augmentation of Transformation Capacity at Sikar(PG)400/220kV substation by 1x500 MVA capacity along with associated bays and 2 nos. of 220 kV line bays as per requirement intimated by RRVPNL	400/220kV		Planned
NR - 35	**NRSS XXXVII**			
	Creation of 400/220kV, 7x105MVA GIS at Jauljivi under ISTS	400/220kV		Planned
	LILO of both ckt. of 400kV Dhauliganga-Bareilly(PG) (presently charged at 220 kV) at 400/220kV Jauljivi S/s	400kV		Planned
	Charging of Jauljivi –Bareilly D/c line at 400kV level	400kV		Planned
	Diversion of Dhauliganga-Bareilly 400kV D/c line(operated at 220kV) at Bareilly end from CB Ganj to 400kV Bareilly(PG) S/s	400kV		Planned
	125MVAr Bus Reactor at 400kV Jauljivi 400/220kV S/s	400kV	Reactor	Planned
	Disconnection of 220kV LILO arrangement of Dhauliganga-Bareilly at Pithoragarh and connecting it to Jauljivi 400/220kV S/s	220kV		Planned
	Shifting of 25 MVAr line reactor already available in 220kV Dhauliganga –Bareilly line at Dhauliganga end, to Jauljibi S/s as a bus reactor	220kV	Reactor	Planned
	Bays associated with NRSS-XXXVI			
	2 nos of 400kV GIS bays at Koteshwar Pooling Station	400kV	Bays	Planned
	One no. of 220kV bay at Roorkee(PG) 400/220kV Substation	220kV	Bays	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Provision of 400kV line bays for LILO of one ckt. of Sikar- Neemrana line at Babai	400kV	Bays	Planned
	Two no. of 400kV line bays at Bhiwani(PG) 400/220kV Substation for Babai – Bhiwani D/C line	400kV	Bays	Planned
NR - 36	**Ultra Mega Solar Parks in Bhadla, Distt. Rajasthan**			
	Bhadla (PG) – Bikaner(PG) 765kV D/C line	765kV	D/c	Planned
	Bhadla (PG)- Bhadla (RVPN) 400kV D/C (Quad) line	400kV	D/c	Planned
	Establishment of Pooling Station at Bhadla (PG) (765/400kV : 3x1500MVA 400/220kV : 3x500MVA,)	765/400kV		Planned
	Establishment of Pooling Station at Bhadla (PG) (765/400kV : 3x1500MVA 400/220kV : 3x500MVA,)	400/220kV		Planned
	2 nos. 400kV & 4 nos. 220kV line bays at Bhadla (PG) for interconnection of solar park interconnection	400kV 220kV	Bays	Planned
	1x240 MVAr switchable line reactor at each end (each ckt) of 765kV Bhadla(PG)- Bikaner(PG) D/C line	765kV	Reactor	Planned
	1x240 MVAr (765kV) & 1x125 MVAr (400kV) Bus reactors at Bhadla Pooling Station	765kV 400kV	Reactor	Planned
NR - 37	**Transmission System for Ultra Mega Solar Park, Fatehgarh, distt. Jaisalmer Rajasthan**			
	765kV Fatehgarh - Bhadla (PG) D/c Line (initially to be operated at 400kV)	765kV	D/c	Planned
	Establishment of 400kV Fatehgarh Pooling Station (with a provision to upgrade at 765kV)	765kV		Planned
	2 nos. of 400kV line bays at Fatehgarh	400kV		Planned
	1X125 MVAr BR at Fatehgarh	400kV		Planned
	1X125 MVAr BR at Generation Switchyard	400kV		Planned
NR - 38	**Augmentation of Transformation Capacity at Raebareli & Sitarganj 220/132 kV substations**	220kV		Planned
	Two nos. of 100 MVA, 220/132 kV ICTs at Raebareli S/s to be replaced by two nos. of 200 MVA ICTs 220/132 kV ICTs.	220kV		Planned
	One out of the two replaced 100 MVA, 220/132 kV ICTs at Raebareli S/s may be installed at Sitarganj S/s and the other may be used as regional spare.	220kV		Planned
NR - 39	**315MVA, 400/220kV ICT at Fatehabad(PG) substation**			
	315MVA, 400/220kV ICT at Fatehabad(PG) substation	400/220kV		Planned
SR - 1	**System Strengthening in SR-XII**			UC
	1. Establishment of new 400/220 kV substation at Yelahanka with 2x500 MVA transformers and 1x63 MVAR bus reactor	400/220kV	trf	UC
	2. LILO of Nelamangla-Hoody 400kV S/c line at Yelahanka 400kV S/S	400kV	D/C	UC
SR - 2	**System Strengthening in SR-XIII**			UC
	3. Madhugiri – Yelahanka 400kV D/C Quad line	400kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
SR - 3	**System Strengthening in SR-XIV**			UC
	1. Salem (New) – Somanahalli 400kV Quad D/C line.	400kV	D/C	UC
SR - 4	**System Strengthening in SR for import of power from ER**			UC
	1. Srikakulam PP- Vemagiri –II Pooling Station 765kV D/C line	765kV	D/C	UC
	2. Khammam (new)- Nagarjunr Sagar 400kV D/C line	400kV	D/C	UC
SR - 5	**Dedicated Transmission System for East Coast Energy Pvt. Ltd. project(1320 MW)[Srikakulam area]**			UC
	1. Generation would be stepped up at 400kV.	400kV		UC
	2. Bus reactor of 1x125MVAR	400kV	Reactor	UC
	3. East Coast Energy generation switchyard – Srikakulam Pooling Station 400kV D/C Quad line alongwith associated bays	400kV	D/C	UC
SR - 6	**ATS for LTOA Projects in Srikakulam area[East Coast Energy Pvt. Ltd. project(1320 MW)]**			
	1. Establishment of 765/400kV Pooling Station in Srikakulam area with 2x1500 MVA 765/400kV transformer capacity	765/400kV	trf	UC
	2. Srikakulam Pooling station – Angul 765 kV D/C line(Initially Charged at 400kV)	765kV	D/C	UC
	3. 765/400kV 1x1500 MVA transformer at Angul	765/400kV	trf	UC
	4. Angul – Jharsuguda 765 kV D/C line	765kV	D/C	UC
	6. Associated 400 kV and 765kV bays at Srikakulam Pooling station, Angul, Jharsuguda and Dharamjaigarh 765/400kV S/Ss.	765/400kV	bay	UC
SR - 7	**Kudgi Phase-I (3x800 MW) (Central Sector)**			UC
	1. Narendra (New) – Madhugiri 765 kV D/c line	765kV	D/C	UC
	2. Madhugiri – Bidadi 400 kV D/c (quad) line.	400kV	D/C	UC
SR - 8	**Dedicated Transmission System for Coastal Energen Pvt. Ltd. Project (Melamuruthur TPP) (2x600MW)**			UC
	1. Generation would be stepped up at 400kV	400kV		UC
	2. Coastal Energen generation switchyard – Tuticorin Pooling Station 400kV D/C Quad line alongwith associated bays	400kV	D/C	UC
SR - 9	**Dedicated Transmission System for Ind-Barath Power (Madras) Ltd. Project(1320MW)**			UC
	1. Generation would be stepped up at 400kV	400kV		UC
	2. Ind-Barath Power generation switchyard – Tuticorin Pooling Station 400kV D/C Quad line alongwith associated bays	400kV	D/C	UC
SR - 10	**ATS for Tuticorin LTA Power Projects in Tuticorin Area**			UC
	3. Salem Pooling Station – Salem 400 kV D/C (quad) line.	400kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	4.Tuticorin Pooling station – Salem Pooling station 765 kV D/C line (initially charged at 400 kV)	765kV-op-400kV	D/C	UC
	5. Salem Pooling Station – Madhugiri Pooling Station 765 kV S/C line (initially charged at 400 kV)	765kV-op-400kV	S/C	UC
	6. Associated 400 kV bays at Tuticorin Pooling station, Salem Pooling Station, Salem and Madhugiri.	400kV	bay	UC
	7 Establishment of 765 kV Pooling station in Salem (initially charged at 400 kV)	765kV-op-400kV		UC
SR - 11	**ATS for ISGS Projects in Nagapattinam and Cuddalore Area of Tamilnadu**			UC
	3. 2 nos. 400kV bays each at Nagapattinam Pooling Station and Salem for terminating Nagapattinam Pooling Station –Salem 765kV D/C line (initially charged at 400kV)being implemented under Tariff based bidding	765kV-op-400kV	bay	UC
	4. 1 no. 400kV bay each at Salem and Madhugiri for terminating Salem- Madhugiri 765 kV S/C line -2(initially charged at 400kV) being implemented under Tariff based bidding	765kV-op-400kV	bay	UC
	5. 2 nos. 400kV bays each at Madhugiri and Narendra for terminating Madhugiri – Narendra 765kV D/C line (initially charged at 400kV) being implemented under Tariff based bidding	765kV-op-400kV	bay	UC
	6. 2 nos. 400kV bays each at Kohlapur ,Padghe & Pune for terminating Kohlapur- Padghe 765kV D/C line (one circuit via Pune) (initially charged at 400kV) being implemented	765kV-op-400kV	bay	UC
	7. Nagapattanam Pooling Station- Salem 765kV D/c line	765kV-op-400kV	D/C	UC
	8. Salem - Madhugiri 765kV S/c line	765kV-op-400kV	S/C	UC
SR - 12	**Kalapakkam PFBR (500MW) (Central Sector)**			UC
	1. Kakapakkam PFBR– Kanchepuram 230 kV D/C line	230kV	D/C	UC
SR - 13	**System Strengthening in SR - XX**			UC
	1. Augmentation of 1x500 MVA 400/220kV Transformer with associated 400kV & 220kV bays at each substations of (1) Hyderabad (Ghanapur), (2) Warangal, (3) Khammam, (4) Vijayawada, (5) Gooty, (6) Cuddapah, (7) Malekuttaiayur, (8) Somanahalli, (9) Mysore, (10) Pugalur and (11) Trichy.	400/220kV	trf	UC
	2.Replacement of 2x315 MVA 400/220kV transformers at Narendra with 2x500 MVA transformers and utilize the replaced 2x315 MVA transformers as regional spare, location to keep the spare shall be decided later.	400/220kV	trf	UC
	3. Conversion of 50 MVAR line reactors at Madakathara end on both circuits of Ellapally (Palakkad) – Madakathara (North Trissur) 400kV D/c line into switchable reactors by providing necessary switching arrangement.	400kV	Reactor	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	4. 2x125 MVAR Bus Reactor at Vijayawada 400kV substation.	400kV	Reactor	UC
SR - 14	**System Strengthening in SR - XXI (Dynamic Recative Compensation in Southern Region)**			UC
	1. At Hyderabad. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 200 MVAR STATCOM	400kV	Reactor / Capacitor	UC
	2. At Udumulpeta. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 200 MVAR STATCOM	400kV	Reactor / Capacitor	UC
	3. At Trichy. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 200 MVAR STATCOM	400kV	Reactor / Capacitor	UC
SR - 15	**System Strengthening in SR - XXIII**			UC
	1. Installation of 1x125 MVAR 400kV bus reactor at Gooty, Hassan, Khammam, Trivendrum, Nellore (existing), Narendra (New) and Nagarjunasagar 400/220 kV substation.	400kV	Reactor	UC
	2. Installation of 2x63 MVAR bus reactors at Yelahanka substation.	400kV	Reactor	UC
	3. Replacement of 63 MVAR bus reactor with 125 MVAR bus reactor at Narendra 400/220 kV substation.	400kV	Reactor	UC
	4. Provision of 1x80 MVAR switchable line reactors at Nellore pooling station on each ckt of Nellore pooling station – Gooty 400 kV Qaud d/c line.	400kV	Reactor	UC
	5. Provision of 400/220 kV, 1x500 MVA ICT at Madurai 400/200 kV substation	400/220kV	trf	UC
	6. Procurement of 1 Nos. 500 MVA, 765/400 kV spare ICT.	765/400kV	trf	UC
SR - 16	**Wardha – Hyderabad 765 kV Link**			UC
	1. Wardha – Hyderabad (Maheshwaram) 765kV D/c line with anchoring at Nizamabad 765/400kV substation	765kV	D/C	UC
	2. Establishment of Nizamabad 765/400 kV GIS Pooling Station with 2x1500 MVA transformers	765/400kV	trf	UC
	3. 1 no. 240 MVAR, 765 kV Bus Reactors at Nizamabad	765kV	Reactor	UC
	4. Nizamabad – Dichpalli 400 kV D/c line.	400kV	D/C	UC
	5. 2 nos. 765kV bays each at Maheshwaram and Wardha for terminating Wardha – Hyderabad (Maheshwaram) 765kV D/c line with anchoring at Nizamabad	765kV	Bays	UC
	6. 1 no. 240 MVAR switchable line reactor at Maheshwaram and Wardha for both circuits of Wardha – Hyderabad (Maheshwaram) 765kV D/c line with anchoring at Nizamabad	765kV	Reactor	UC
	7. 4 nos. 765kV bays at Nizamabad for anchoring of Wardha – Hyderabad (Maheshwaram) 765kV D/c line	765kV	Bays	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	8. 1 no. 240 MVAR switchable line reactor at Nizamabad for both circuits of Wardha – Nizamabad 765kV D/c line and Nizamabad – Hyderabad (Maheshwaram) 765kV D/c line	765kV	Reactor	UC
SR - 17	**Sub-station Works associated with Hyderabad (Maheshwaram) Pooling Station**			UC
	1. Establishment of Maheshwaram (PG) 765/400 kV GIS substation with 2x1500 MVA transformers	765/400kV	trf	UC
	2. LILO of Hyderabad – Kurnool 400 kV s/c line at Maheshwaram (PG) substation.	400kV	D/C	UC
	3. 2 nos. 240 MVAR, 765 kV Bus Reactors at Maheshwaram Pooling Station	765kV	Reactor	UC
SR - 18	**Transmission System for evacuation of power from 2x500 MW Neyveli Lignite Corp. Ltd. TS-I (Replacement) (NNTPS) in Neyveli**			Planned
SR - 53- A	**Transmission System for Connectivity**			UC
	1. 7x167 MVA (single phase), 400/220 kV transformers at generation switchyard (by NLC)	400/220kV	trf	UC
	2. 1x80 MVAR Bus Reactor at generation switchyard (by NLC)	400kV	Reactor	UC
	3. LILO of existing Neyveli TS-II – Pondycherry 400 kV SC at NNTPS	400kV	S/C	UC
SR - 53- B	**Transmission System for LTA (as an ISTS)**			UC
	1. NNTPS switchyard – Villupuram (Ginjee) 400kV D/c line	400kV	D/C	UC
	2. 2 nos. of line bays at Ariyalur (Villupuram) substation for terminating NNTPS switchyard – Ariyalur (Villupuram) 400kV D/c line	400kV	bays	UC
SR - 19	**Additional inter-regional AC link for import into SR i.e. Warora – Warangal and Chilakaluripeta - Hyderabad - Kurnool 765kV link"**			UC
	1. Establishment of 765/400kV substation at Warangal (New) with 2x1500 MVA transformer	765/400kV	trf	UC
	2. 2x240 MVAR bus reactors at Warangal (New) 765/400 kV SS	765kV	Reactor	UC
	3. Warora Pool -Warangal (New) 765 kV DC line	765kV	D/C	UC
	4. 240 MVAR switchable line reactor at both ends.	765kV	Reactor	UC
	5. Warangal (New) –Hyderabad 765 kV DC line	765kV	D/C	UC
	6. 240 MVAR switchable line reactor at Warangal end	765kV	Reactor	UC
	7. Warangal (New) – Warangal (existing) 400 kV (quad) DC line.	400kV	D/C	UC
	8. Hyderabad– Kurnool 765 kV D/c line	765kV	D/C	UC
	9. 240 MVAR switchable line reactor at Kurnool end	765kV	Reactor	UC
	10. Warangal (New) – Chilakaluripeta 765kV DC line	765kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	11. 240 MVAR switchable line reactor at both ends.	765kV	Reactor	UC
SR - 20	**Strengthening of transmission system beyond Vemagiri**			UC
	1. Vemagiri-II – Chilakaluripeta 765kV DC line	765kV	D/C	UC
	2. 240 MVAR switchable line reactor at both ends.	765kV	Reactor	UC
	3. Chilakaluripeta – Cuddapah 765kV DC line	765kV	D/C	UC
	4. 240 MVAR switchable line reactor at both ends.	765kV	Reactor	UC
	5. Chilakaluripeta – Narsaraopeta 400kV (quad) DC line	400kV	D/C	UC
	6. Cuddapah – Madhugiri 400kV (quad) DC line	400kV	D/C	UC
	7. 80 MVAR switchableline reactor at both ends.	400kV		UC
	10. Srikaukulam Pooling Station – Garividi 400 kV (Quad) D/c line	400kV	D/C	UC
	11. 80MVAR switchable line reactor at Garividi end.	400kV	Reactor	UC
	12. Establishment of 765/400kV substation at Chilakaluripeta with 2x1500 MVA transformers	765/400kV	trf	UC
	13. 2x240 MVAR bus reactor at Chilakaluripeta 765/400kV SS	765kV	Reactor	UC
SR - 21	**Scheme-I : HVDC Bipole link between Western region (Raigarh, Chhattisgarh) and Southern region (Pugalur, Tamil Nadu)- Madakathara/ North Trichur (Kerala)**			UC
	1. ± 800 kV Raigarh(HVDC Stn) – Pugalur(HVDC Stn) HVDC Bipole link with 6000 MW capacity.	±800kV	HVDC	UC
	2. Establishment of Raigarh HVDC Stn and Pugalur HVDC Stn with 6000 MW HVDC terminals	±800kV	HVDC	UC
SR - 54-C-B	**Scheme-II :HVDC Bipole link between Western region (Raigarh, Chhattisgarh) and Southern region (Pugalur, Tamil Nadu)- Madakathara/ North Trichur (Kerala)**			UC
	1. Pugalur HVDC Station – Pugalur (Existing) 400kV (quad) DC line.	400kV	D/C	UC
	2. Pugalur HVDC Station – Arasur 400kV (quad) DC line	400kV	D/C	UC
	3. 80 MVAR switchable line reactor at Arasur end.	400kV	Reactor	UC
	4. Pugalur HVDC Station – Thiruvalam 400kV (quad) DC line	400kV	D/C	UC
	5. 1x80MVAR switchable line reactor at both ends.	400kV	Reactor	UC
	6. Pugalur HVDC Station – Edayarpalayam 400 kV (quad) DC	400kV	D/C	UC
	7. 1x63MVAR switchable line reactor at Edayarpalayam end.	400kV	Reactor	UC
	8. Edayarpalayam – Udumulpeta 400 kV (quad) DC line.	400kV	D/C	UC
SR - 54-C-C	**Scheme-III : HVDC Bipole link between Western region (Raigarh, Chhattisgarh) and Southern region (Pugalur, Tamil Nadu)- Madakathara/ North Trichur (Kerala)**			UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	1. Establishment of VSC based 2000 MW HVDC link between Pugalur and North Trichur* (Kerala)	±320kV	HVDC	UC
	2. LILO of North-Trichur – Cochin 400 kV (Quad) D/c line at North Trichur HVDC Stn.	400kV	D/C	UC
SR - 22	**Mangalore (UPCL)–Kasargode-Kozhikode 400 kV link**			Planned
	1. Mangalore (UPCL)–Kasargode 400 kV D/c Quad line	400kV	D/C	Planned
	2. Kasargode - Kozhokode, 400kV quad D/c line,	400kV	D/C	Planned
	3. Establishment of 2x500 MVA, 400/220 kV GIS substation at Kasargode	400/220kV	trf	Planned
SR - 23	**Connectivity lines for Maheshwaram (Hyderabad)765/400kV Pooling S/s.**			UC
	1 Maheshwaram (PG) – Mahboob Nagar 400 kV D/C line	400kV	D/C	UC
	2. Nizamabad – Yeddumailaram (Shankarapalli) 400 kV D/C line	400kV	D/C	UC
SR - 24	**SRSS-XXIV**			UC
	1Establishment of 765/400kV substation at Cuddapah with 2x1500 MVA transformers	765/400kV	trf	UC
	2. 2x240 MVAR bus reactor at Cuddapah 765/400kV SS	765kV	Reactor	UC
	3. LILO of Kurnool-Thiruvalam 765 kV D/c at Cuddapah along with associated bays	765kV	D/C	UC
	4. Cuddapah-Hindupur 400 kV (Quad) D/C line alongwith associated bays and 80 MVAR switchable line reactor at Hindupur end (Hindupur S/s to be implemented by APTRANSCO)	400kV	D/C	UC
	5. 80 MVAR switchable line reactor at Hindupur end.	400kV	400kV	UC
SR - 25	**Additional System for import of Power from Eastern Region**			New
	1. Angul - Srijkakulam 765 kV 2nd D/c line	765kV	D/C	New
	2. Srikakulam - Vemagiri 765 kV 2nd D/c line	765kV	D/C	New
	3. Vemagiri - C'Peta 765 kV D/c line	765kV	D/C	New
SR - 26	**Raigarh-Pugalur Scheme under Tamil Nadu scope**			
	5. +/- 100 MVAR STATCOM at N.P Kunta	400kV	STATCOM	UC
SR - 27	**Transmission System for Ultra mega solar park in Anantapur distt, AP - Part-B**			UC
	1. LILO of Cuddapah-Hindupur 400 kV (Quad) D/c line at NP Kunta	400kV	D/C	UC
	2. 6 nos. 220kV line bays at NP Kunta Pooling Station	220kV	bays	UC
SR - 28	**Transmission System for Ultra mega solar park in Anantapur distt, AP - Part-C**			UC
	1. Augmentation of transformation capacity at NP Kunta station with 4th,1x500 MVA, 400/220kV transformer	400/220kV	trf	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	2. 4 nos. 220kV line bays at NP Kunta Pooling Station	220kV	bays	UC
SR - 29	**Green Energy Corridors-ISTS-Part-A**			UC
	1. Establishment of 2x500 MVA, 400/230 kV S/s at Tirunelveli Pooling Station	400/220kV	trf	UC
	2. Tirunelveli Pooling Station-Tuticorin Pooling Station 400 kV 2x D/c (Quad) line	400kV	2xD/C	UC
SR - 30	**NLC-Karaikal 230 kV D/c**			UC
	1. NLC-Karaikal 220 kV D/c linei. (through LILO of the 230kV Neyveli- Bahour S/c line at Karaikal)	220kV	D/C	UC
SR - 31	**Constraints in 400 kV bays extensions at 400 kV Vemagiri S/s**			UC
	1. LILO of both circuits of Gazuwaka/Simhadri-II-Vemagiri-I (AP) 400 kV D/c line at Vemagiri-II (PG).	400kV	D/C	UC
	2. Straighten LILO of Vijaywada (Nunna)-Simhadri-II/Gazuwaka 400 kV D/c line (by disconnecting the LILO at Vemagiri-I (AP)), so as to make Vijaywada (Nunna) - Vemagiri-II 400 kV D/c line.	400kV	D/C	UC
	3. Utilization of one LILO D/c portion (of Gazuwaka/Simhadri-II - Vijaywada (Nunna) at Vemagiri-I (AP)) for KV Kota-Vemagiri-I (AP) 400 kV D/c line	400kV	D/C	UC
	4. Second LILO D/c portion (of Gazuwaka/Simhadri-II - Vijaywada (Nunna) at Vemagiri-I (AP)) to be extended to Vemagiri-II (PG).	400kV	D/C	UC
SR - 32	**Connectivity for Kudankulam 3&4 (2x1000MW) with interstate Transmission system.**			UC
	1.Extension of Kudankulam APP Tirunelveli 400kV Quad D/c line to Tuticorin Pooling Station along with necessary bay modification works at Tuticorin Pooling station	400kV	D/C	UC
SR - 33	**Transmission System for Tumkur (Pavgada) Ultra Mega Solar Park (2000MW)**			Planned
SR - 34	**Phase-I (1000MW)**			
	(i) LILO of 400kV Gooty – Tumkur (Vasantnarsapur) D/c at Tumkur (Pavagada) Pooling station	400kV	D/C	Planned
	(ii) Tumkur (Pavagada) Pooling station - Hiriyur 400 kV D/c(as part of Tumkur (Pavagada) Pooling station - Mysore line)	400kV	D/C	Planned
	(iii) LILO of 400kV Bellary Pool – Tumkur (Vasantnarsapur) D/c (Quad)(both circuits)[KPTCL line] at Tumkur (Pavagada) Pooling station.	400kV	D/C	Planned
	(iv) 3x500 MVA, 400/220KV Pooling station at Tumkur(Pavagada) .	400/220kV	Trf	Planned
	(v) 1x125MVAR bus reactor at 400/220KV Tumkur (Pavagada) Pooling station	400/220kV	Reactor	Planned
	(vi) 220kV Bays(8 Nos) at Tumkur (Pavagada) PS for interconnection with solar project	220kV	Bays	Planned
SR - 35	**Phase-II(1000MW)**			
	(i) Hiriyur – Mysore 400 kV D/c line$	400kV	D/C	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	(ii) Tumkur (Pavagada) Pooling station-Devanahally (KPTCL) 400kV D/c (Quad)	400kV	D/C	Planned
	(iii) Augmentation of 2x500 MVA, 400/220KV transformer at Tumkur (Pavagada) Pooling station	400/220kV	Trf	Planned
	(iv) 1x125MVAR bus reactor (2nd) at Tumkur (Pavagada) Pooling Station	400/220kV	Reactor	Planned
	(v) Third 400/220 kV, 1x500 MVA transformer at Tumkur (Vasantnarsapur)	400/220kV	Trf	Planned
	(vii) 1x80 MVAR switchable Line reactor at Mysore end of Hiriyur- Mysore D/c for each circuit.	400kV	Reactor	Planned
	(viii) 8 nos. 220kV line Bays at 400/220kV Tumkur (Pavagada) PS for Solar Interconnection	220kV	Bays	Planned
SR - 36	**Augmentation of Transformation capacity in Southern Region**			Planned
	1. 400/230 kV, 1X500 MVA ICT at Arasur	400/230kV	Trf	Planned
	2. 400/230 kV, 1X500 MVA ICT at Karaikudi	400/230kV	Trf	Planned
	3. 400/230 kV, 1X500 MVA ICT at Tirunelveli	400/230kV	Trf	Planned
	4. 400/230 kV, 1X500 MVA ICT at Pondicherry	400/230kV	Trf	Planned
	5. 400/220 kV, 1X500 MVA ICT at Kozhikode	400/220kV	Trf	Planned
SR - 37	**Installation of Bus Reactors at Cuddapah, Nellore, Kurnool, Raichur and Thiruvalam**			Planned
	1. 400kV, 125 MVAr bus reactor at Cuddapah	400kV	Reactor	Planned
	2. 765kV, 240 MVAr bus reactor at Kurnool	765kV	Reactor	Planned
	3. 765kV, 240 MVAr bus reactor at Nellore	765kV	Reactor	Planned
	4. 765kV, 240 MVAr bus reactor at Raichur	765kV	Reactor	Planned
	5. 765kV, 2 x 240 MVAr bus reactors at Thiruvalam	765kV	Reactor	Planned
SR - 38	**Conversion of fixed line reactors to switchable line reactors in Southern Region**			Planned
	Conversion of Line Reactor of 50 MVAR at Hyderabad end of Gazwel-Hyderabad II line to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactors of 50 MVAR each at both ends of Nellore-Tiruvellam I & II lines to switchable line reactors.	400kV	Reactor	Planned
	Conversion of Line Reactor of 50 MVAR at Sriperumbadur end of Sriperumbadur-Chitoor line to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 63 MVAR at Udumalpet end of Udumalpet-Salem II line to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 63 MVAR at Madurai end of Madurai-Karaikudi line to switchable line reactor.	400kV	Reactor	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Conversion of Line Reactor of 50 MVAR at Sriperumbadur end of Sriperumbadur-SV Chatram line to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactors of 63 MVAR at Kochi end of Kochi-Tirunelveli-I & II lines to switchable line reactors.	400kV	Reactor	Planned
	Conversion of Line Reactor of 50 MVAR at Madurai end of Madurai-Trichy line to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 50 MVAR at Trichy end of Trichy- Nagapattinam I to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 63 MVAR at Trichy end of Trichy- Nagapattinam II to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 50 MVAR at Salem end of Salem- Hosur II to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 50 MVAR at Hyderabad end of Malakaram-Hyderabad-II (Upto LILO point) to switchable line reactor.	400kV	Reactor	Planned
	Conversion of Line Reactor of 50 MVAR at Gooty end of Kurnool-Gooty to switchable line reactor.	400kV	Reactor	Planned
WR- 1	**Transformers for HVDC back-to-back (BTB) station at Bhadrawati**			
	1. 3 nos. of spare converter transformers.	400kV	Coneverter Trf	UC
WR- 2	**Dynamic Recative Compensation in Western Region**			
	1. At Aurangabad. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 300 MVAR STATCOM	400kV	reactor / capacitor	UC
	2. At Gwalior 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 200 MVAR STATCOM	400kV	reactor / capacitor	UC
	3. At Satna. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 300 MVAR STATCOM	400kV	reactor / capacitor	UC
	4 At Solpaur. 2x125 MVAR MSR, 1X125 MVAR MSC & +/- 300 MVAR STATCOM	400kV	reactor / capacitor	UC
WR- 3	**Installation of Bus Reactor and ICT in Western Region**			
	1. 1x125MVAR Bus Reactor at Bina substation	400kV	Reactor	UC
	2. 1x1500MVA (4th), 765/400kV transformer at Raigarh Pooling Station (near Tamnar)	765/400kV	trf	UC
	3. 1x500 MVA (3rd), 400/220 kV transformer at Damoh alongwith 2 nos. 220 kV bays	400/220kV	trf	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	4. 1x1500MVA (2nd), 765/400kV transformer at Raipur Pooling Station	765/400kV	trf	UC
	5. 2x500 MVA, 400/220 kV transformer at Vadodara alongwith 4 nos. 220 kV GIS bays	400/220kV	trf	UC
	6. 2 nos. 63 MVAR switchable line reactors at Rajgarh for Rajgarh-Sardar Sarovar 400 kV D/c line.	400kV	Reactor	UC
WR- 4	**ATS for KAPP Extn U-3,4, (1400MW)(Central sector)**			
	1. Kakrapar NPP-Navsari 400kV D/C line	400kV	D/C	UC
	2. Kakrapar NPP-Vapi 400kV D/C line	400kV	D/C	UC
WR- 5	**ATS for Mundra UMPP(4000MW)-Part B (Streghtening in WR)**			
	2. Navsari-Boisar 400 kV D/C line	400kV	D/C	UC
	3. Wardha-Aurangabad 400 kV (Quad) D/c (with provision to upgrade at 1200 kV at later date)	400kV	D/C	UC
	12. 40% Fixed Series compensation each on Wardha - Aurangabad 400 kV D/c at Wardha end.	400kV		UC
WR- 6	**DGEN TPS -Torrent Power Ltd. (1200 MW)**			
	2. DGEN TPS-Vadodara 400 kV D/C (twin Moose)	400kV	D/C	UC
	3. Navsari-Bhestan 220 kV D/C line	400kV	D/C	UC
WR- 7	**Vindhyachal –V (500 MW) (Central Sector)**			
	1. Vindhyachal - Vindhyachal Pooling Station 400kV D/c (quad) line	400kV	D/C	UC
WR- 8	**ATS for Mauda STPS- II (2X660) MW**			
	1. Mauda II - Betul 400kV D/C (Quad)	400kV	D/C	UC
	2. Betul -Khandwa 400kV D/C(Quad)	400kV	D/C	UC
	3. Khandwa-Indore 400kV D/C(second circuit)	400kV	D/C	UC
	4. 400/220kV, 2X315 MVA S/S at Betul	400/220kV	trf	UC
WR- 9	**Dedicated Transmission Scheme for Lanco Amarkantak, Balco and Vandana Vidyut**			
WR-18	**Akaltara (KSK Mahanadi) Power Ltd (6X600MW)**			
	KSK Mahanadi – Champa Pooling Station 400kV 2xD/c (Quad)	400kV	2xD/C	UC
WR-18	**Dedicated Transmission line for Lanco Amarkantak Power(2X660MW)**			
	Lanco - Champa Pooling Station 400kV D/c (Quad)	400kV	D/C	UC
WR-18	**Balco Ltd (2x300MW)**			
	Balco – Dharamjaygarh Pooling Station 400kV D/c	400kV	D/C	UC
WR-18	**Vandana Vidyut Ltd. (4x135MW)**			
	Vandana Vidyut – Daramjaygarh Pooling Station 400 kV D/C line	400kV	D/C	UC
WR- 10	**Combined ATS for Generation Projects located in Raigarh Complex near Kotra, Raigarh complex near Tamnar, Champa complex and Raipur complex of Chhattisgarh-Part-D**			

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Aurangabad(PG) – Boisar / Kharghar 400kV D/c (Quad) line.	400kV	D/C	UC
WR- 11	**Combined ATS for Generation Projects located in Raigarh Complex near Kotra, Raigarh complex near Tamnar, Champa complex and Raipur complex of Chhattisgarh-Part-E**			
	1. Aurangabad (PG) – Padghe(PG) 765kV D/c line	765kV	D/C	UC
	2. Padghe (PG) – Kudus(MSETCL) 400kV D/c (Quad) line.	400kV	D/C	UC
	4. Establishment of 765/400kV, 2x1500MVA Padghe(PG) S/s [GIS Substation]	765/400kV	trf	UC
WR- 12	**Combined ATS for Generation Projects located in Raigarh Complex near Kotra, Raigarh complex near Tamnar, Champa complex and Raipur complex of Chhattisgarh-Part-F**			
	Raipur Pooling Station – Wardha 765kV 2nd D/c line	765kV	S/C	UC
WR- 13	**Combined ATS for Generation Projects located in Raigarh Complex near Kotra, Raigarh complex near Tamnar, Champa complex and Raipur complex of Chhattisgarh-Part-I**			
	1. A ±800kV, 6000 MW HVDC bipole between Champa Pooling Station (WR) – near Kurushetra (NR) in Haryana with metallic return (initially to be operated at 3000 MW).	±800kV	HVDC	UC
	2. Establishment of 3000 MW, ±800 kV HVDC bipole terminal each at Champa pooling station and near Kurushetra in Haryana with provision to upgrade the terminals to 6000 MW.	±800kV	HVDC	UC
	5. Establishment of 400/220kV, 2x500 MVA S/s at Kurukshetra	400/220kV	trf	UC
WR- 14	**Transmission System for Essar Power Gujarat Limited (EPGL)**			
	1. Essar Power TPS –Bachau 400 kV D/c (triple) line	400kV	D/C	UC
	2. 1x63 MVAR line reactor at Bachau end on both circuits of above line	400kV	Reactor	UC
WR- 15	**Transmission System Associated with Gadarwara STPS (2x800MW) of NTPC (Part-A)**			
	1.Gadarwara - Jabalpur Pool 765kV D/c line,	765kV	D/C	UC
	2. Gadarwara - Warora Pool 765kV D/c line	765kV	D/C	UC
	3. LILO of all both circuits of Wardha - Parli (new) 400kV D/c line at Warora Pool,	400kV	2xD/C	UC
	4.Establishment of 2x1500MVA, 765/400kV substation at Warora.	765/400kV	trf	UC
	1X 330 MVAR, 765 kV bus reactor at 765/400kV, 2x1500MVA Warora Pooling Station		Reactor	planned
	1X 330 MVAR, 765 kV bus reactor at 765 kV Gadarwara STPS Switchyard		Reactor	planned
	1 X 330 MVAR line reactor for Gadarwara STPS – Warora Pooling Station 765 kV D/c line both ends and both lines (Switchable at Gadarwara end & fixed at Warora end)		Reactor	planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	1 X 80 MVAR switchable line reactor for Warora Pool – Parli (PG) 400 kV D/c quad line at Warora for both lines		Reactor	planned
WR- 16	**Transmission System Associated with Gadarwara STPS (2x800MW) of NTPC (Part-B) (WRSS - 15)**			
	1. Warora Pool - Parli 765kV D/c line	765kV	D/C	UC
	2.Parli - Solapur 765kV D/c line	765kV	D/C	UC
	3.Parli(new) - Parli (PG) 400kV D/c (quad) line,	400kV	D/C	UC
	4. Establishment of 2x1500MVA, 765/400kV substation at Parli (new).	765/400kV	trf	UC
	1X 330 MVAR, 765 kV bus reactor at 765/400kV, 2x1500MVA Parli (New) S/s			planned
	1 X 330 MVAR line reactor for Warora Pooling Station – Parli (New) 765kV D/c line both ends for both lines (Switchable at Warora end & fixed at Parli (new) end)			planned
WR- 17	**Solapur STPP(2x660MW) transmission system - Part A**			UC
	1. Solapur STPP – Solapur (PG) 400kV 2nd D/c (Quad).	400kV	D/C	UC
WR- 18	**Transmission System Associated with Lara STPS-I (2x800MW)**			UC
	Lara STPS-I – Champa Pooling Station 400 kV D/c (quad) line.	400kV	D/C	UC
WR- 19	**Inter Regional System Strenghtening for WR and NR Part - B**			
	1. Establishment of 2x1000MVA 765/400 kV station at Orai	765/400kV	trf	UC
	2. LILO of one circuit of Satna – Gwalior 765 kV line at Orai	765kV	D/C	UC
	3. Establishment of 2x1500MVA 765/400 kV station at Aligarh	765/400kV	trf	UC
	3a. LILO of Agra – Meerut 765 kV line at Aligarh	765kV	D/C	UC
	4. Jabalpur Pooling Station – Orai 765kV D/c line	765kV	D/C	UC
	5. LILO of Kanpur – Jhatikara 765kV S/c line at Aligarh S/s	765kV	D/C	UC
	6. Orai – Aligarh 765 kV D/c line	765kV	D/C	UC
	7. Orai-Orai (UPPCL) 400kV D/c Quad – 20 km	400kV	D/C	UC
WR- 20	**Green Energy Corridor (GEC) ISTS Part B & C**			
	1. Bhuj Pool–Banaskanta 765 kV D/c	765kV	D/C	UC
	2. Banaskanta -Chittorgarh 765 kV D/c	765kV	D/C	UC
	3. Banaskanta-Sankhari 400 kV D/c	400kV	D/C	UC
	4. Chittoragrh (new) - Ajmer (new) 765 kV D/C line	765kV	D/C	UC
	4.establishment of 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) substation at Bhuj Pool	765/400kV	trf	UC
	4.establishment of 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) substation each at Banaskanta	765/400kV	trf	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
WR- 21	**System Strengthening for IPPs in Chhattisgarh and other generation projects in WR**			
	1. Gwalior - Morena 400kV D/c line.	400kV	D/C	UC
	2. Establishment of 2x315MVA, 400/220kV substation at Morena,	400/220kV	trf	UC
	3. Vindhyachal-IV & V STPP - Vindhyachal Pooling Station 400kV D/c (Quad) 2nd line	400kV	D/C	UC
	4. Sasan UMPP - Vindhyachal Pooling Station 2nd 765kV S/c line,	765kV	S/C	UC
	5. LILO of one circuit of Aurnagabad - Padghe 765kV D/c line at Pune,	765kV	D/C	UC
	6. Raigarh (Kotra) - Champa Pool 765kV 2nd S/c line	765kV	S/C	UC
	7.Champa Pool - Dharamjaigarh 765kV 2nd S/c line.	765kV	S/C	UC
	1 X 125 MVAR bus reactor at 400/220kV, 2x315MVA Morena Substation	400kV	Reactor	UC
WR- 22	**Additional System Strengthening for Chhattisgarh IPPs**			
	1. Raipur Pool - Rajnandgaon 765kV D/c line	765kV	D/C	UC
	2. Bilaspur Pool - Rajnandgaon 765kV D/c line	765kV	D/C	UC
	2.Rajnandgaon - Warora Pool 765kV D/c line	765kV	D/C	UC
	4.Establishment of 765V substation at Rajnandgaon	765kV	trf	UC
	1 X 330 MVAR, 765 kV bus reactor at765 kV Morena Substation Rajnandgaon Switching Station	765kV	Reactor	planned
	1 X 330 MVAR switchable line reactor for Rajnandgaon – Warora Pooling Station 765kV D/c for both lines at Rajnandgaon end	765kV	Reactor	planned
WR- 23	**Essar Power MP Ltd. (Mahan Phase II) (600 MW) (Private Sector)**			
	1. Bus extension of Mahan TPS phase-1 generation project to proposed generation project switchyard along with 1x125MVAR bus rector (connectivity)	400kV		Planned
WR- 24	**Transmission System Associated with Vindhyachal –V**			UC
	1. 2 nos. 765kV bays at Vindhyachal Pooling station & Jabalpur Pooling station	765kV	bays	UC
	2. 1 X 330 MVAR, 765 kV line Reactor alongwith 850 Ohm NGR on both circuit at both endsof Vindhyachal PS - Jabalpur PS 765 kV D/C	765kV	Reactor	UC
	3. 1x1500MVA, 765/400kV ICT Vindhyachal Pooling Station	765/400kV	trf	UC
	4. Vindhyachal Pooling station - Jabalpur Pooling Station 765kV D/c line	765kV	D/C	UC
WR- 25	**NPCIL Jaitapur (3480MW) (Central Sector)**			
	1. Jaitapur - Kolhapur 765 kV D/C line. (connectivity)	765kV	D/C	Planned
	2.Kolhapur - Solapur/Pune(GIS) 765kV D/c line	765kV	D/c	Planned

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
WR- 26	**Dedicated Transmission line for Karnataka Power Corp Ltd.(KPCL) 1600MW)**			
	KPCL – Champa Pooling Station 400 kV D/C	400kV	D/C	UC
WR- 27	**Transmission System Associated with Barethi TPP (NTPC Ltd) (2640MW)**			
	1. Barethi TPP -Orai 765kV D/c	765kV	D/C	Planned
	2.Orai-Bareilly 765kV D/c	765kV	S/C	Planned
WR- 28	**Transmission System Associated with Khargone TPP (NTPC Ltd) (1320MW)**			
	1. Khargone TPP -Khandwa Pool 400kV D/c (High Capacity)	400kV	D/C	UC
	2. Indore- Khandwa Pool 765kV D/c	765kV	D/C	UC
	2. Dhule- Khandwa Pool 765kV D/c	765kV	D/C	UC
WR- 29	**Transmission System Strengthening in WR-NR Transmission Corridor**			
	1. Up-gradation of ±800kV, 3000MW HVDC Bipole terminal Capacity between Champa Pooling Station & Kurukshetra (NR) to 6000MW	±800kV	HVDC	UC
	2. Kurukshetra - Jind 400kV D/c Quad	400kV	D/C	UC
WR- 30	**Transmission Systemassociated with Rewa Pooling Station**			
	1. Establishment of 400/220kV, 3x500MVA Pooling station at Rewa	400/220kV	trf	UC
	2. LILO of Vindhyachal - Jabalpur 400kV 2nd D/c line at Rewa PS	400kV	D/C	UC
	3. 1x125MVAr BR ar Rewa PS	400kV	Reactor	UC
	4. 6 nos. 220kV bays at Rewa PS	220kV	bays	UC
WR- 31	**Western Region System Strengthening -V**			
	1. 400 kV Vapi- Kala - Kudus D/c	400kV	D/C	UC
	2. LILO of 400 kV Lonikhand - Kalwa line at Navi Mumbai	400kV	S/C	UC
	3. Establishment of 400/220 kV, 2 x 315 MVA new S/s (GIS) at Navi Mumbai	400/220kV	trf	UC
WR- 32	**Establishment of Pooling Station at Champa and Raigarh (Near Tamnar) for IPP Generation Projects in Chhattisagrh**			
	Establishment of 765/400kV 6x1500MVA Champa Pooling Station	765/400kV	trf	UC
WR- 33	**Wardha - Hyderabad 765kV Links**			
	(a) 765KV D/C Wardha - Hyderabad line	765kV	D/C	UC
	(b) 400KV D/C Nizamabad - Dichpali line	400kV	D/C	UC
WR- 34	**Western Region System Strengthening Scheme XIV**			
	(a)2x500MVA, 400/220kV transformer alongwith six nos of 220kV bays at Indore (PG) 765/400kV Substation	400/220kV	trf	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	(b)1x500MVA, 400/220kV transformer alongwith two nos of 220kV bays at Itarsi (PG) 400/220kV S/s	400/220kV	trf	UC
WR- 35	**Transmission System Strengthening associated with Mundra UMPP- Part B**			
	(a) Mundra UMPP - Bhuj Pool 400kV D/c line (triple snowbird)	400kV	D/C	UC
WR- 36	**Transmission System Strengthening associated with Mundra UMPP- Part A**			
	(a) LILO of both circuits of Mundra UMPP-Limbdi 400kV D/c (triple snowbird) line at Bachau	400kV	D/C	UC
WR- 37	**Western Region System Strengthening -16**			
	(a) Installation of 2x500MVA, 400/220kV ICTs with associated bays at Parli (PG) switching station along with provision of six nos. of 220 kV bays	400/220kV	trf	UC
	(c) Provision of two nos. of 220kV bays at Mapusa (Colvale) 400/220 kV substation	220kV	bays	UC
	(d) Installation of 500MVA, 400/220kV (3rd) ICT with associated bays at Satna (PG) S/s with provision of two nos. 220kV line bays	400/220kV	trf	UC
	(e) Provision of two nos. of 400 kV bays at 765/400kV Indore(PG) substation	400kV	bays	UC
WR- 38	**Western Region System Strengthening -17**			
	1. Provision of 1x240 MVAR switchable line reactor at Pune GIS S/s end {for Aurangabad (PG) – Pune GIS 765kV S/C line, formed after LILO of one ckt of Aurangabad (PG) – Padghe (PG) 765kV D/C line at Pune GIS}.	400kV	Reactor	UC
	2. Conversion of followings Fixed Line Reactor into Switchable Line Reactors / BUS Reactor.	400kV		
	a. Aurangabad (PG) – Aurangabad I (Waluj) 400kV D/c (Quad) line: 420kV 50 MVAR fixed line reactor at Aurangabad I (Waluj) to be converted into Switchable Line Reactor.	400kV	Reactor	UC
	b. Itarsi – Indore (MPPTCL) 400kV 2xS/C lines: 420kV 50 MVAR fixed line reactors at both ends of each line are to be converted into switchable line reactors.	400kV	Reactor	UC
	c. Bina (PG) – Shujalpur 400kV D/C line: 420kV 50 MVAR fixed line reactor at Shujalpur end is to be converted into switchable line reactor. The 420kV 63 MVAR line reactor installed at Bina (PG) end is already switchable.	400kV	Reactor	UC
	d. 1x63 MVAR BUS Reactor at Bhadravati S/s: 420kV 63 MVAR fixed line reactor at Bhadravati end of Bhadravati – Dhariwal 400kV S/c line is to be converted into BUS Reactor at Bhadravati (NGR if any to be removed).	400kV	Reactor	UC
	3. Installation of ICTs along with associated bays at following substations of POWERGRID:			
	a. Khandwa 400/220kV Substation: 1x500 MVA, 400/220kV 3rd ICT.	400/220kV	trf	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	b. Boisar 400/220kV Substation: 1x500 MVA, 400/220kV 4th ICT.	400/220kV	trf	UC
	c. Kala 400/220kV Substation: 1x500 MVA, 400/220kV 3rd ICT.	400/220kV	trf	UC
	d. Dehgam 400/220kV Substation: 1x500 MVA, 400/220kV 3rd ICT.	400/220kV	trf	UC
WR- 39	**Western Region System Strengthening -18**			
	1. Splitting of following substation along with necessary switching arrangement.		split	
	a. Dharamjaygarh Pool 765kV BUS	765kV		planned
	b. Raigarh Pool (Kotra) 400kV & 765kV BUS	765 & 400		planned
	c. Champa Pool 400 kV & 765kV BUS	765 & 400		planned
	2. Installation of Reactors:			
	a. 1X125 MVAR BUS Reactor at 400kV BUS Section A of Dharamjaygarh Pool.	400kV	Reactor	UC
	b. 1X125 MVAR BUS Reactor at 400kV BUS Section A of Raigarh Pool (Kotra).	400kV	Reactor	UC
	c. 1X240 MVAR BUS Reactor at 765kV BUS Section A of Raigarh Pool (Kotra).	765kV	Reactor	UC
	d. 1X240 MVAR BUS Reactor at 765kV BUS Section A of Champa Pool.	765kV	Reactor	UC
	e. 1X330 MVAR BUS Reactor at 765kV BUS Section B of Dharamjaygarh Pool.	765kV	Reactor	UC
WR- 40	**Transmission System for UMSPP at Radhanesda (Banaskantha)**			
	Banaskantha (Radhanesda) Pooling Station - Banaskantha 400kV D/c line	400kV	D/C	planned
WR- 41	**Additional 400kV Feed to Goa**			
	(i) LILO of one ckt. of Narendra (existing) – Narendra (New) 400kV D/c quad line at Xeldem	400kV	S/C	UC
	(ii) Xeldem – Mapusa 400kV D/c (quad) line	400kV	D/C	UC
	(iii) Establishment of 2x500MVA, 400/220kV substation at Xeldem	400/220kV	trf	UC
	(iv) 2 nos of 400 kV line bays at Mapusa s/s (for Xeldem – Mapusa 400kV D/c (quad) line)	400kV	bays	UC
	(v) 1x80MVAR switchable line reactor along with 500 Ohms NGR and its auxiliaries at Narendra (New) S/s (for Narendra (New) –Xeldem 400kV (quad) line formed after LILO of one ckt of Narendra (existing) – Narendra (New) 400kV D/c quad line at Xeldem)	400kV	Reactor	UC
WR- 42	**Measures to control Fault Level at pooling stations / substations in Chhattisgarh area**			
	(i) Dharamjaygarh Pool section B - Raigarh (Tamnar) Pool 765kV D/c line	765kV	D/C	UC
	(ii) 2 nos of 765kV line bays at Section B of Dharamjaygarh Pool	765kV	bays	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	(iii) 2 nos of 765kV line bays at Raigarh (Tamnar) Pool	765kV	bays	UC
WR- 43	**Connectivity of M/s LVTPL (2 X 660 MW)**			
	Warora PS - LVTPL 765 kV D/C	765kV	D/C	planned
WR- 44	**Powergrid works associated with Part-A of Transmission system for Gadarwara STPS of NTPC**			UC
	a) 2 nos. 765 kV line bays at 765/400kV Jabalpur Pooling Station of POWERGRID {for Gadarwara STPS (NTPC) - Jabalpur PS 765 kV D/c}	765kV	bays	UC
WR- 45	**Powergrid works associated with Part-B of Transmission system for Gadarwara STPS of NTPC i.e. WRSS XV**			UC
	(a) 2 nos. 765 kV line bays at 765/400kV Solapur sub-station of POWERGRID {for Parli New (TBCB) - Solapur (PG) 765 kV D/c}	765kV	bays	UC
	(b) 2 nos 400kV line bays at existing 400kV Parli (PG) Switching Station of POWERGRID {for Parli New (TBCB) - Parli (PG) 400kV D/c (quad)}	400kV	bays	UC
WR- 46	**Powergrid works associated with System Strengthening for IPPs in Chhattisgarh and other generation projects in Western Region**			
	(a) 1 no. 765 kV line bay at 765/400kV Vindhyachal Pooling Station of POWERGRID {for Sasan UMPP - Vindhyachal PS (PG) 765 kV 2nd S/c}	765kV	bays	UC
	(b) 2 no. 400 kV line bays at 765/400kV Vindhyachal Pooling Station of POWERGRID {for Vindhaychal (IV/V) STPP switchyard (NTPC) - Vindhyachal PS (PG) 400 kV 2nd D/c (quad)}	400kV	bays	UC
	(c) 2 no. 400 kV line bays at Gwalior Substation {for Gwalior - Morena 400 kV D/c (quad)}	400kV	bays	UC
	(d) 2 nos. 765 kV line bays at 765/400kV Pune (GIS) sub-station of POWERGRID {for LILO of one circuit of Aurangabad(PG) – Padghe(PG)765 kV D/c at Pune (GIS) (PG)}	765kV	bays	UC
	(e) 2 nos. 765 kV line bays at 765/400kV Champa Pooling Station of POWERGRID {1for Champa PS(PG) - Raigarh (Kotra) PS(PG) 765 kV 2nd S/c, 1 for Champa PS(PG) – Dharamjaigarh(PG) 765 kV 2nd S/c}	765kV	bays	UC
	(f) 1 no. 765 kV line bay at 765/400kV Raigarh (Kotra) Pooling Station of POWERGRID {for Champa PS(PG) - Raigarh (Kotra) PS(PG) 765 kV 2nd S/c}	765kV	bays	UC
	(g) 1 no. 765 kV line bay at 765/400kV Dharamjaigarh Pooling Station of POWERGRID {for Champa PS(PG) – Dharamjaigarh(PG)765 kV 2nd S/c}	765kV	bays	UC
WR- 47	**Powergrid works associated withAdditional System Strengthening Scheme Chhattisagrh IPPs Part-B**			
	(a) 2 nos. 765 kV line bay at 765/400kV Raipur Pooling Station of POWERGRID {for Raipur PS(PG) – Rajnandgaon (TBCB) 765 kV D/c}	765kV	bays	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
WR- 48	**Powergrid workds associated with Additional System Strengthening for Sipat STPS**			
	(a) 3 nos. 765 kV line bays at 765/400kV Bilaspur Pooling Station of POWERGRID (1 no. for Sipat STPS(NTPC) - Bilapur PS(PG) 3rd 765kV S/c, 2 nos. for Bilaspur PS(PG)-Rajnandgaon(TBCB) 765 kV D/c)	765kV	bays	UC
	(b) 2 nos. 240 MVAR, 765 kV switchable line reactors at 765/400kV Bilaspur PS end for Bilaspur PS(PG) - Rajnandgaon(TBCB) 765 kV D/c	765kV	bays	UC
WR- 49	**Bays for Transmission System Associated with DGEN Torrent Energy Ltd (1200MW)**			
	(a) 2nos 400kV Bays at Vadodara (GIS)	400kV	bays	UC
	(b) 2nos 220kV Bays at Navsari (GIS)	220kV	bays	UC
WR- 50	**Transmission System for DEL TPP (1320 MW)**			
	(i) DEL TPP Switchyard – Khandwa pool 400kV D/c (Quad) line	400kV	D/C	Planned
WR- 51	**Connectivity System for M/s Jinbhuvish Power Generations Pvt. Ltd. (JPGPL) (600MW)**			Planned
	(i) JPGPL TPS Switchyard – Warora Pool 400kV D/c line (to be implemented through Tariff Base Competitive Bidding route)	400kV	D/C	Planned
WR- 52	**Conectivity of Rewa Ultra Mega Solar Ltd Park**			UC
WR- 53	**Additional Transmission System Strengtheining for Sipat STPS**			UC
	(i) Sipat – Bilaspur Pooling Station765 kV S/C line	765kV	S/C	UC
	(ii) Bilaspur Pooling Station - Rajnandgaon 765 kV D/C line	765kV	D/C	UC
	1 x 240 MVAR, 765 kV switchable line reactor for Bilaspur Pooling Station – Rajnandgaon 765kV D/c for both lines at Bilaspur end	765kV	Reacto r	UC
WR- 54	**Additional inter-Regional AC link for import into Southern Region i.e. Warora – Warangal and Chilakaluripeta - Hyderabad - Kurnool 765kV link**			UC
	(i) Establishment of 765/400kV substations at Warangal (New) with 2x1500 MVA transformers and 2x240 MVAR bus reactors. 765/400kV	765/400k V	S/s	UC
	(ii) Warora Pool – Warangal (New) 765kV D/c line with 240 MVAR switchable line reactor at both ends. 765 KV D/C	765kV	D/C	UC
	(iii) Warangal (New) –Hyderabad 765 kV D/c line with 330 MVAR switchable line reactor at Warangal end.	765kV	D/C	UC
	(iv) Warangal (New) – Warangal (existing) 400 kV (quad) D/c line. 400KV D/C	400kV	D/C	UC
	(v) Hyderabad – Kurnool 765 kV D/c line with 240 MVAR switchable line reactor at Kurnool end. 765 KV D/C	765kV	D/C	UC
	(vi) Warangal (New) – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends.765 KV D/C	765kV	D/C	UC

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Cuddapah – Hoodi 400kV (quad) D/c line with 63 MVAR switchable line reactor at both ends. 400 KV D/C	400kV	D/C	UC
WR- 55	**Common Transmission System for Phase-II Generation Projects in Odisha and Immediate Evacuation System for OPGC (1320 MW) Project in Odisha**			UC
	(i) OPGC (IB TPS) – Jharsuguda (Sundargarh) 400kV D/C line with Triple Snowbird Conductor 400 kV D/C Length- 50 KM	400kV	D/C	UC
	Jharsuguda (Sundargarh)– Raipur Pool 765 kV D/C line	765kV	D/C	UC
WR- 56	**Measures to control High fault levels observed in Korba STPS (3x200MW + 4x500MW)**			
	Korba STPS - Korba West 400 kV S/C line to be normally kept open.	400kV	S/c	UC
	Korba STPS- Sipat STPS 400 kV S/C line and Sipat STPS – Raipur 400 kV S/C line to be rearranged as Korba STPS- Raipur 400 kV S/C line (bypassing at Sipat STPS). The bypassing arrangement at Sipat STPS already exists.	400kV	S/c	UC
WR- 57	**INTER - REGIONAL CORRIDOR BETWEEN WR AND NR**			
	Vindhyanchal PS – Varanasi 765 kV D/C line (along-with 2 nos. 765kV line bays at both ends)	765kV	D/C	UC
	765kV, 1x330MVAr line reactor at Varanasi (GIS) end on each circuit of Vindhyachal PS – Varanasi (GIS) 765kV D/c line.	765kV	Reactor	UC
WR- 58	**Connectivity Transmission System for Srijan Wind Farm in Bhuj, dist. Kutch Gujarat**			
	SESPL switchyard – Bhuj PS 220kV D/c line along with line bays at both ends	220kV	D/C	UC
WR- 59	**Connectivity Transmission System for Renew Power Ventures Pvt. Ltd.**			
	RPVPL switchyard – Bhachau 220kV D/c line along with associated line bays at both ends *Line bays at Bhachau end to be implemented as GIS	220kV	D/C	UC
WR- 60	**Connectivity Transmission System for Ostro Kutch Wind Pvt. Ltd.**			
	OKWPL switchyard – Bhachau 220kV D/c line along with associated line bays at both ends *Line bays at Bhachau end to be implemented as GIS	220kV	D/C	UC
WR- 61	**Connectivity Transmission System for Adani Green Energy Ltd. (AGEL) : 300 MW**			
	AGEL - Sami (Adani) 220 kV D/c line (along-with associated line bays at both ends)	220kV	D/C	UC
	1x500 MVA, 400/220 kV ICT at Sami (Adani) substation	220kV	D/C	UC
WR- 62	**Inter State Transmission system strengthening in Chhatarpur area in Madhya Pradesh**			

Sl. No.	Scheme /details	Voltage (kV)	Type	Present Status
	Establishment of 2x500 MVA, 400/220 kV substation at Bijawar	400/220kV	trf	UC
	LILO of Satna – Bina 400kV (1st) D/c line at Bijawar. (There are four 400kV circuits between Satna and Bina out of which one is proposed to be LILOed at Sagar (MPPTCL) Substation. This LILO is on one D/c out of the above three remaining 400kV circuits between Satna and Bina).	400kV	D/C	UC
	1X125 MVAr, 420 kV Bus Reactor at Bijawar PS.	400kV	Reactor	UC
	4 nos. 220kV line bays for termination of LILO of both ckts of Tikamgarh - Chatarpur 220 kV D/c line.	220kV	bays	UC
	Space for 4 nos. of 220kV line bays for solar park interconnections	220kV	space	UC

Annex – 7.3

Intra State Transmission system up to 13th Plan

Sl. No.	Scheme /details	Type	Voltage level	Region
ER - 1	**System Strengthening Scheme in West Bengal**		Scheme	ER
	Chanditala - Kharagpur 400 kV D/c line	D/C	400kV	ER
ER - 2	**Common Transmission System under the scope of Govt. of Sikkim**		Scheme	ER
	Establishment of 220kV substation at Legship	D/C	220kV	ER
	Legship - New Melli 220kV D/c with twin moose conductor	D/C	220kV	ER
	1. Establishment of 220kV Gas Insulated Pooling/Switching Station at Legship	sw	220kV	ER
	2. Legship Pooling station – New Melli 220kV D/c with twin moose conductor	D/C	220kV	ER
ER - 3	**System Strengthening in West Bengal**		Scheme	ER
	New Substation at Katwa New	trf	400kV	ER
	Chanditala-Bakreswar 400kV D/c line	D/C	400kV	ER
	Chanditala-Katwa New 400kV D/c line	D/C	400kV	ER
	New Substation at Mayureswar	trf	400kV	ER
	New Substation at Burdwan	trf	400kV	ER
	LILO of Arambagh - Bidhannagar S/c line at Burdwan	S/C	400kV	ER
ER - 4	**Eastern Region Strengthening Scheme – XVII (PART-A)**		Scheme	ER
	Dhanbad (Jharkhand)- Govindpur 220 kV line	D/C	220kV	ER
	Dhanbad (Jharkhand)- Jainamore 220 kV line	D/C	220kV	ER
ER - 5	**400 kV D/c (Quad) line (Part of Transmission System associated with DVC & Maithon RB Generation ProjectsSupplementary Scheme)**		Scheme	ER
	Daltonganj (PG)-Latehar (JUSNL) 220 kV D/C	D/C	220kV	ER
	Daltonganj (PG)-Garwa (JUSNL) 220 kV D/C	D/C	220kV	ER
	Daltonganj (PG)-Daltonganj (JUSNL) 132 kV D/C	D/C	132kV	ER
	Daltonganj (PG)-Chatrapur / Lesliganj (JUSNL) 132 kV D/C	D/C	132kV	ER
	Latehar-ESSAR 400 kV D/C line to Chandwa pooling station	D/C	400kV	ER
ER - 6	**Bihar BRGF Phase 3**		Scheme	
	Gaya - Sonnagar 220kV D/c line	D/C	220kV	ER
ER - 7	**Bihar Phase IV part-1**		Scheme	ER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Construction of 2x160 MVA + 2x50 MVA 220/132/33 kV new GIS S/S at Chapra	trf	220kV	ER
	Construction of 2x160 MVA + 3x50 MVA, 220/132/33 kV new GIS S/S at Gaya (Manpur)	trf	220kV	ER
	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS S/S at Nawada	trf	220kV	ER
	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS S/S at Sheikhpura	trf	220kV	ER
	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS S/S at Hathidah	trf	220kV	ER
	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS S/S at Jamalpur	trf	220kV	ER
	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS S/S at Sabour	trf	220kV	ER
	Chapra 220/132 kV new S/S – Chapra 132/33 kV S/S, 132 kV D/C line (Zebra conductor)	trf	220kV	ER
	Hazipur 220/132 kV new S/S – Chapra 220/132 kV S/S, 220 kV D/C line	D/C	220kV	ER
	Chapra 220/132 kV S/S – Siwan, 132 kV D/C line	D/C	132kV	ER
	LILO of one circuit of 132 kV D/C Khagual-Digha line at Bihta	2xS/C	132kV	ER
	Patna (POWERGRID)-Khagaul, 220 kV D/C line	D/C	220kV	ER
	LILO of 220 kV D/C Biharsharif – Bodhgaya line at Gaya (new) (Manpur) S/S	2xD/C	220kV	ER
	132KV D/C Gaya(new) – Jehanabad line	D/C	132kV	ER
	LILO of 132 kV S/C Bodhgaya-Wazirganj line at Gaya new (Manpur) S/ S	2xS/C	132kV	ER
	132 kV S/C (on D/C Tower) Gaya new (Manpur)-Hulasganj line	S/c on D/c	132kV	ER
	220 kV D/C (High Capacity) Gaya (POWERGRID)-Gaya new (Manpur) line	D/C	220kV	ER
	220 kV D/C (High Capacity) Nawada new-Gaya new (Manpur) line	D/C	220kV	ER
	132 kV D/C Sheikhpura(New) – Sheikhpura (Old) transmission line (High Capacity)	D/C	132kV	ER
	220 kV D/C Sheikhpura (New) – Nawada (New) transmission line (High Capacity)	D/C	220kV	ER
	220 kV D/C (High Capacity) Jamalpur new-Sheikhpura (New) transmission line	D/C	220kV	ER
	132 kV S/C (on D/C tower) Sheikhpura new – Biharsharif transmission line	S/C	132kV	ER
	132 kV D/C Nawada (New) – Nawada 132/33 kV (High Capacity) S/S	D/C	132kV	ER
	LILO of 220 kV Begusarai-Biharsharif line at 220 kV Hathidah	2xD/C	220kV	ER

Sl. No.	Scheme /details	Type	Voltage level	Region
	132 KV D/C Hathidah (New) –Hathidah (Old) transmission line (Zebra Conductor)	D/C	132kV	ER
	LILO of 132 kV D/C (High Capacity) Sultanganj-Lakhisarai transmission line at Jamalpur	2xD/C	132kV	ER
	132 kV D/C Jamalpur (New) – Jamalpur (Old) transmission line (Zebra Conductor)	D/C	132kV	ER
	132 kV D/C Sabour (New) – Sabour (Old) transmission line (Zebra Conductor)	D/C	132kV	ER
	LILO of 132 kV D/C Kahalgaon-Sultanganj line at Sabour	2xD/C	132kV	ER
	220 kV D/C (High Capacity) Sabour (New) – Jamalpur (New) transmission line	D/C	220kV	ER
ER - 8	**Bihar Phase IV part-2**		Scheme	ER
	Establishment of 2x500 MVA +2x160 MVA+2x80 MVA 400/220/132 kV S/S at Naubatpur	trf	400kV	ER
	LILO of circuits 3 & 4 of Patna (PG)-Balia 400 kV D/c (Quad) line at Naubatpur 400 kV 2x D/C line	2xD/C	400kV	ER
	LILO of both circuits of Ara (PG) – Khagaul (BSPTCL) line at Naubatpur (New) 220 kV 2xD/C	2xD/C	220kV	ER
	Naubatpur (New)-Bihta (BSPTCL) 220 kV D/C line	D/C	220kV	ER
	Naubatpur (New)-Bhusaula (New) 220 kV D/C Transmission line	D/C	220kV	ER
	Naubatpur (New)- Paliganj 132 kV D/C Transmission line	D/C	132kV	ER
	Naubatpur (New)- Masaurhi (existing) 132 kV D/C Transmission line	D/C	132kV	ER
	Naubatpur (New)- Attula (existing) 132 kV D/C Transmission line.	D/C	132kV	ER
	Establishment of 2x500 MVA +2x160 MVA 400/220/132 kV GIS S/S at Bakhtiyarpur	trf	400kV	ER
	LILO of both circuits of Barh – Patna (PG) 400kV D/c (Quad) line-1 at Bakhtiyarpur 400 kV 2xD/C	2xD/C	400kV	ER
	Bakhtiyarpur (New) - Sheikhpura (New) 220 kV D/C line.	D/C	220kV	ER
	Bakhtiyarpur (New) - Hathidah (New) 220 kV D/C line.	D/C	220kV	ER
	Bakhtiyarpur (New) - Fatuha (BSPTCL) 220 kV D/C line.	D/C	220kV	ER
	Bakhtiyarpur (New) - Harnaut (BSPTCL) 132 kV D/C line	D/C	132kV	ER
	Bakhtiyarpur (New) - Baripahari (BSPTCL) 132 kV D/C line.	D/C	132kV	ER
	132 kV D/C Bakhtiyarpur (New) - Baripahari (BSPTCL) line.	D/C	132kV	ER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Establishment of 2x500 MVA +3x160 MVA+3x80 MVA 400/220/132/33 kV GIS S/S at Jakkanpur	trf	400kV	ER
	LILO of both circuits of Nabinagar-II – Patna (PG) 400kV D/c at Jakkanpur 400 kV 2xD/C	2xD/C	400kV	ER
	LILO of both circuits of Sipara (BSPTCL)-Bihta (BSPTCL) line at Jakkanpur (new) 2x220 kV D/C	2xD/C	220kV	ER
	LILO of Khagaul (BSPTCL) - Sipara (BSPTCL) 220 kV S/C line at Jakkanpur (New) 220 kV D/C	D/C	220kV	ER
	LILO of both circuits of Jakkanpur-Sipara line at Jakkanpur New (being re-conductored with HTLS by BSPTCL) 2x132 kV D/C	2xS/c	132kV	ER
	LILO of 132 KV S/C Jakkanpur/Mithapur-Fatuha line at Jakkanpur New (being re-conductored with HTLS by BSPTCL) 132 kV line	2xS/c	132kV	ER
	Establishment of 2x100 MVA 220/33 kV GIS S/S at Bhusaula	trf	220kV	ER
	Establishment of 2x160 MVA+2x80 MVA 220/132/33 kV GIS S/S at Dumraon	trf	220kV	ER
	LILO of both circuits of 220 kV Ara (PG)-Pusauli (PG) D/c line at Dumraon (New) 2x220 kV D/C	2xD/C	220kV	ER
	Dumraon (New)- Dumraon (BSPTCL) 132 kV D/C	D/C	132kV	ER
	Dumraon (New)- Buxarn (BSPTCL) 132 kV D/C	D/C	132kV	ER
	Dumraon (New)- Jagdishpur (BSPTCL) 132 kV D/C	D/C	132kV	ER
	LILO of one circuit of Purnea-Naugachia / Khagaria 132 kV D/C line at Katihar (BSPTCL)	D/C	132kV	ER
ER - 9	**BSPTCL works under 13th Plan**		Scheme	ER
	Sitamarhi (New) – Motipur (BSPTCL) 220kV D/c line	D/C	220kV	ER
	Sitamarhi (New) – Motihari (New of BSPTCL) 220kV D/c line	D/C	220kV	ER
	Sitamarhi (New) – Sitamarhi 132kV D/c (Single Moose) line	D/C	132kV	ER
	Sitamarhi (New) – Pupri 132kV D/c line	D/C	132kV	ER
	LILO of Gaya (POWERGRID) – Sonenagar 220kV D/c at both Bodhgaya (BSPTCL) and Chandauti (New) substations, so as to form Gaya (POWERGRID) – Bodhgaya (BSPTCL) – Chandauti (New) – Sonenagar 220kV D/c line	2xD/C	220kV	ER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Reconductoring of Chandauti (BSPTCL) – Rafiganj – Sonenagar 132kV S/c line with HTLS conductor	S/C	132kV	ER
	LILO of Chandauti (BSPTCL) – Rafiganj 132kV S/c line at Chandauti (New)	S/C	132kV	ER
	Reconductoring of Chandauti – Sonenagar 132kV S/c line with HTLS conductor of 240MVA (ampacity - 1050A)	S/C	132kV	ER
	LILO of Chandauti – Sonenagar 132kV S/c line at Chandauti (New)	2xS/C	132kV	ER
	Saharsa (New) – Begusarai 220kV D/c line	D/C	220kV	ER
	Saharsa (New) – Khagaria (New) 220kV D/c line	D/C	220kV	ER
	Saharsa (New) – Saharsa 132kV D/c	D/C	132kV	ER
	Motihari (New) S/s: 220/132kV, 2x200MVA	trf	220kV	ER
	Sitamarhi (New) – Motihari (New) 220kV D/c (Twin Moose)	D/C	220kV	ER
	Motihari (New) – Gopalganj 220kV D/c(Twin Moose)	D/C	220kV	ER
	Motihari (New) – Raxaul 132kV D/c	D/C	132kV	ER
	Motihari (New) – Betiah 132kV D/c (Single Moose)	D/C	132kV	ER
	Karmanasa (New) 220/132kV S/s: 2x200MVA	trf	220kV	ER
	LILO of Sasaram – Sahupuri 220kV S/c at Karmnasa (New)	2xS/C	220kV	ER
	Karmnasa (New) – Pusauli (BSPTCL) 220kV D/c line (Twin Moose)	D/C	220kV	ER
	Karmnasa (New) – Mohania 132kV D/c (Single Moose)	D/C	132kV	ER
	Karmnasa (New) – Karmnasa 132kV D/c (Single Moose)	D/C	132kV	ER
	Upgradation of Korha (New) 132/33kV to 220/132kV S/s with 2x100MVA ICT	trf	220kV	ER
	LILO of both circuits of Purnea (POWERGRID) – Khagaria (New) 220kV D/c at Korha (New)	2xD/C	220kV	ER
	Augmentation of 3rd 220/132kV 200MVA ICT at Bihta New	trf	220kV	ER
	Augmentation of 3rd 220/132kV 160MVA ICT at Chapra New	trf	220kV	ER
	Augmentation of 3rd 220/132kV 160MVA ICT at Gopalganj	trf	220kV	ER
	Augmentation of 3rd 220/132kV 160MVA ICT at Kishanganj New	trf	220kV	ER
	Augmentation of 3rd 220/132kV 160MVA ICT at Sonenagar	trf	220kV	ER
	Replacement of 3x100MVA 220/132kV ICT with 3x200MVA at Darbhanga	trf	220kV	ER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Replacement of 3x100MVA 220/132kV ICT with 3x200MVA at Hazipur	trf	220kV	ER
	Replacement of 4x100MVA 220/132kV ICT with 4x200MVA at Khagaul	trf	220kV	ER
	Replacement of 2x150+160MVA 220/132kV ICT with 3x200MVA at Sipara	trf	220kV	ER
	Re-conductoring with HTLS Kanti – SKMCH 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Dehri – Banjari 132kV S/c	S/C	132kV	ER
	Re-conductoring with HTLS Barauni – Begusarai 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Mithapur – Karbhigaiya 132kV S/c	S/C	132kV	ER
	Re-conductoring with HTLS Arrah (POWERGRID) – Arrah 132kV S/c	S/C	132kV	ER
	Re-conductoring with HTLS Lakhisarai (POWERGRID) – Lakhisarai 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Chhapra (New) – Chhapra 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Kishanganj (Old) – Kishanganj (New) 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Chandauti – Tekari 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Kahalgaon – Sabour 132kV S/c	S/C	132kV	ER
	Re-conductoring with HTLS Kahalgaon – Kahalgaon (BSPTCL) 132kV S/c	S/C	132kV	ER
	Re-conductoring with HTLS Dehri – Sonenagar 132kV D/c	D/C	132kV	ER
	Re-conductoring with HTLS Biharsharif – Baripahari 132kV D/c	D/C	132kV	ER
	Stringing of 2nd circuit of Saharsa – Sonebarsa 132kV S/c on D/c	S/C	132kV	ER
	Stringing of 2nd circuit of Muzaffarpur – SKMCH 132kV S/c on D/c	S/C	132kV	ER
	Muzaffarpur – Chhapra 220kV D/c	D/C	220kV	ER
	Laukhi – Phulparas 132kV D/c (HTLS)	D/C	132kV	ER
	Vaishali – Hazipur 132kV D/c	D/C	132kV	ER
ER - 10	**Odisha Intra-state strengthening**		Scheme	ER
	2x500MVA, 400/220kV sub-station at Meramundali-B	trf	400kV	ER
	Shifting of Duburi – Meramundali 400kV D/c line from Meramundali to Meramundali-B	D/C	400kV	ER
	Shifting of GMR – Meramundali 400kV S/c line from Meramundali to Meramundali-B (1x350MW unit of GMR shall be connected to Odisha grid through the subject line)	S/C	400kV	ER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Shifting of Duburi – Meramundali 220kV D/c line from Meramundali to Meramundali-B	D/C	220kV	ER
	2x500MVA, 400/220kV sub-station at Narendrapur (New)	trf	400kV	ER
	Pandiabil – Narendrapur (New) 400kV D/c line	D/C	400kV	ER
	Narendrapur (New) – Aska 220kV D/c line	D/C	220kV	ER
	LILO of both the circuits of existing Therubali – Narendrapur 220kV D/c line at Narendrapur(New)	2xD/C	220kV	ER
	2x500MVA, 400/220kV sub-station at Khuntuni	trf	400kV	ER
	LILO of Meramundali-B – Duburi 400kV D/c line *(formed after Shifting of Duburi – Meramundali 400kV D/c line from Meramundali to Meramundali-B)* at Khuntuni	2xD/C	400kV	ER
	LILO of Meramundali – Mendhasal 400kV D/c line at Khuntuni	2xD/C	400kV	ER
	Khuntuni – Dhenkanal (New) 220kV D/c line	D/C	220kV	ER
	Khuntuni – Bidanasi 220kV D/c line	D/C	220kV	ER
NER - 1	**ATS for Monarchak (105 MW)**		Scheme	NER
	1. Monarchak-Badarghat-Kumarghat-Badarpur Sw. Stn 132kV D/c line	D/C	132kV	NER
	2. Monarchak-Rabindra nagar 132kV D/c line	D/C	132kV	NER
	3. Establishment of Rabindra Nagar 132/33kV Substation 2x25 MVA)	trf	132kV	NER
	4. Establishment of Badarghat (Agartala New) 132/33kV Substation (2x25 MVA)	trf	132kV	NER
NER - 2	**System Strengthening Scheme in Arunachal Pradesh (Phase-I)**		Scheme	NER
	1. Khupi - Seppa 132kV S/c on D/C line	S/C on D/C	132kV	NER
	2. Seppa-Sagali 132kV S/c on D/C line	S/C on D/C	132kV	NER
	3. Sagali-Naharlagun 132kV S/c on D/C line	S/C on D/C	132kV	NER
	4. Naharlagun-Gerukamukh 132kV S/c on D/C line	S/C on D/C	132kV	NER
	5. Gerukamukh – Likabali 132kV S/c on D/C line	S/C on D/C	132kV	NER
	6. Likabali – Niglok 132kV S/c on D/C line	S/C on D/C	132kV	NER
	7. Niglok-Pasighat 132kV S/c on D/C line	S/C on D/C	132kV	NER
	8. Deomali – Khonsa 132kV S/c line	S/C	132kV	NER
	9. Khonsa – Changlong 132kV S/c line	S/C	132kV	NER
	10. Changlang – Jairampur 132kV S/c line	S/C	132kV	NER
	11. Jairampur - Miao 132kV S/c on D/C line	S/C	132kV	NER
	12. Miao - Namsai (PG) 132kV S/c on D/C line	S/C on D/C	132kV	NER

Sl. No.	Scheme /details	Type	Voltage level	Region
	13. Teju-Halaipani 132kV S/c on D/C line	S/C on D/C	132kV	NER
	14. Naharlagun-Banderdewa132kV S/c on D/C line	S/C on D/C	132kV	NER
	15. Seppa 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	16. Sagali 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	17. Naharlagun 132/33 kV S/s, 2x31.5 MVA	trf	132kV	NER
	18. Gerukamukh 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	19. Likabali 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	20. Niglok 132/33 kV S/s, 2x31.5 MVA	trf	132kV	NER
	21. Pasighat 132/33 kV (2nd S/s), 7x5 MVA (single phase-one spare)	trf	132kV	NER
	22. Khonsa 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	23. Changlang 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	24. Jairampur 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	25. Miao 132/33 kV S/s, 7x5 MVA (single phase-one spare)	trf	132kV	NER
	26. Halaipani 132/33 kV S/s, 4x5 MVA (single phase-one spare)	trf	132kV	NER
	27. Banderdewa 132/33 kV S/s, 2x25 MVA (single phase-one spare)	trf	132kV	NER
	28.Pasighat New (Napit)-Pasighat Old	D/C	132kV	NER
NER - 3	**System Strengthening Scheme in Arunachal Pradesh (Phase-II)**		Scheme	NER
	1. Palin-Koloriang 132kV S/c line	S/C on D/C	132kV	NER
	2. LILO of Daporijo-Along 132 kV D/C at Basar	D/C	132kV	NER
	3. Roing - Anini 132kV S/c line on D/C	S/C on D/C	132kV	NER
	4. Along - Reying 132kV S/c line on D/C	S/C on D/C	132kV	NER
	5. Along - Yingkiong 132kV S/c line on D/C	S/C on D/C	132kV	NER
	6. Establishment of Palin 132/33kV substation (7x5 MVA single Phase)	trf	132kV	NER
	7. Establishment of Koloriang 132/33kV Substation (7x5 MVA single Phase)	trf	132kV	NER
	8. Establishment of Basar 132/33kV Substation (7x5 MVAsingle Phase)	trf	132kV	NER
	9. Establishment of Yingkiong 132/33kV Substation (7x5 MVA single Phase)	trf	132kV	NER

Sl. No.	Scheme /details	Type	Voltage level	Region
	10. Establishment of Dambuk 132/33kV Substation (4x5 MVA single Phase)	trf	132kV	NER
	11. Establishment of Seijosa 132/33kV Substation 4x5 MVA single Phase)	trf	132kV	NER
	12. Establishment of Bameng 132/33kV Substation (4x5 MVA single Phase)	trf	132kV	NER
	13. Ziro 132/33kV Substation (Aug.) (4x8 MVA)	trf	132kV	NER
	14. Daporijo 132/33kV Substation (Aug.) (2x12.5 MVA)	trf	132kV	NER
	15. Kambang 132/33kV Substation (4x5 MVA single Phase)	trf	132kV	NER
	16. Ziro - Palin 132kV S/c line	S/C	132kV	NER
	17.Along – Kambang	S/C on D/C	132kV	NER
	18.Kambang - Mechuka	S/C on D/C	132kV	NER
	19.Yingkiong - Tuting	S/C on D/C	132kV	NER
	20.Ziro (PG) - Ziro New	S/C on D/C	132kV	NER
	21.Tawang - Lumla	S/C on D/C	132kV	NER
	22.Daporijo - Nacho	S/C on D/C	132kV	NER
	23.Khonsa - Longding	S/C on D/C	132kV	NER
	24.Roing (PG) - Dambuk	S/C on D/C	132kV	NER
	25.Pasighat Old - Mariyang	S/C on D/C	132kV	NER
	26.Rilo - Seijosa	S/C on D/C	132kV	NER
	27.Seppa - Bameng	S/C on D/C	132kV	NER
	28. Chimpu (Itanagar)-Holongi	S/C on D/C	132kV	NER
NER - 4	**System Strengthening Scheme (World Bank) in Assam (Tranche-I)**		Scheme	NER
	Rangia – Amingaon	D/C	220kV	NER
	Tinsukia – Behiating (New Dibrugarh)	D/C	220kV	NER
	Kahilipara – Guwahati Medical College (incl. 2kms. Cable)	D/C	132kV	NER
	Rupai-Chapakhowa (with 4KM river crossing via Dhola)	S/C on D/C	132kV	NER
	Dhemaji – Silapathar	S/C on D/C	132kV	NER
	Amingaon - Hazo	D/C	132kV	NER
	KAMAKHYA-PALTANBAZAR (UG CABLE)	S/C	132kV	NER
	LILO of one circuit of Rangia - Rowta at Tangla	D/C	132kV	NER
	LILO of Golaghat – Bokajan 132 kV S/c line at Sarupathar	D/C	132kV	NER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Sonabil - Tezpur (New)	D/C	132kV	NER
	LILO of Jorhat (Gormur) – Nazira 132 kV S/c on D/c at Teok.	S/C on D/C	132kV	NER
	LILO of Kamalpur – Sishugram 132kV S/c line at Amingaon 220/132kV S/s	D/C	132kV	NER
	LILO of Kamalpur – Kamakhya 132kV S/c line at Amingaon 220/132kV S/s	D/C	132kV	NER
	New S/S			NER
	Amingaon (GIS)	trf	220kV	NER
	Behiating (New Dibrugarh)	trf	220kV	NER
	Guwahati Medical College (GIS)	trf	132kV	NER
	Chapakhowa (4x8.33 MVA)	trf	132kV	NER
	Silapathar	trf	132kV	NER
	Hazo	trf	132kV	NER
	Paltanbazar	trf	132kV	NER
	Tangla	trf	132kV	NER
	Sarupathar	trf	132kV	NER
	Tezpur New	trf	132kV	NER
	Teok	trf	132kV	NER
	S/S Augmentation			NER
	Samaguri	trf	220kV	NER
	Dhaligaon	trf	132kV	NER
	Samaguri	trf	132kV	NER
NER - 5	**System Strengthening Scheme (World Bank) in Manipur (Tranche-I)**		Scheme	NER
	Imphal - Ningthoukhong	D/c	132kV	NER
	LILO of Yurembam(Imphal-State) - Karong at Gamphajol	D/C	132kV	NER
	LILO of one circuit of Kongba – Kakching 132 kV D/c line (one ckt existing + other ckt under this scheme) at Thoubal 132/33kV substation	D/C	132kV	NER
	Stringing of Yaingangpokpi - Kongba 132kV 2nd ckt	S/C	132kV	NER
	Stringing of Kakching - Kongba 132kV 2nd ckt	S/C	132kV	NER
	Stringing of Kakching - Churachandpur 132kV 2nd ckt	S/C	132kV	NER
	Renovation of Yurembum – Karong - Mao(Manipur-Nagaland border) section of Yurembum-Karong-Kohima 132kV S/c line	S/C	132kV	NER
	Rengpang-Tamanglong S/c on D/c	S/c on D/c	132kV	NER
	New Sub-Station			NER
	Gamphajol	trf	132kV	NER
	S/S Augmentation			NER
	Ningthoukhong (2nd tfr)	trf	132kV	NER
	Jiribam (2nd tfr)	trf	132kV	NER
	Kongba (2nd tfr)	trf	132kV	NER
	Tamenglong (7x6.67 MVA)	trf	132kV	NER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Ukhrul	trf	132kV	NER
NER - 6	**System Strengthening Scheme (World Bank) in Mizoram (Tranche-I)**		Scheme	NER
	Lungsen - Chawngte (charged at 33kV)	S/C	132kV	NER
	Chawngte - S. Bungtlang(charged at 33kV)	S/C	132kV	NER
	W. Phaileng - Marpara	S/C on D/C	132kV	NER
	New S/S			NER
	Lungsen New SUBSTATION	trf	132kV	NER
	W. Phaileng	trf	132kV	NER
	Marpara	trf	132kV	NER
	S/S Augmentation			NER
	Lunglei Bay Extn	extn	33kV	NER
	Lungsen Extn Bay Extn	extn	33kV	NER
	CHAWNGTE Extn Bay Extn	extn	33kV	NER
	CHAWNGTE Extn Bay Extn	extn	33kV	NER
	S.BUNGTLANG Extn Bay Extn	extn	33kV	NER
NER - 7	**System Strengthening Scheme (World Bank) in Tripura (Tranche-I)**		Scheme	NER
	Rokhia-Rabindranagar	D/C	132kV	NER
	LILO of one circuit of Surajmaninaqar - Rokhia 132 kV D/c line at Gokulnagar	D/C	132kV	NER
	LILO of PK Bari-Ambasa at Monu	D/C	132kV	NER
	Kailasahar - Dharamnagar	D/C	132kV	NER
	Rabindranagar - Belonia	D/C	132kV	NER
	Udaipur - Bagafa	D/C	132kV	NER
	Bagafa - Belonia	D/C	132kV	NER
	Belonia - Sabroom	D/C	132kV	NER
	LILO of Agartala 79 Tilla - Dhalabil (Khowai) 132KV S/C LINE	D/C	132kV	NER
	Bagafa – Satchand 132 kV S/c on D/c line (utilizing the corridor of existing Bagafa – Satchand 66 kV line)	S/C ON D/C	132kV	NER
	Udaipur - Amarpur 132 kV D/c line	D/C	132kV	NER
	New S/S			NER
	Rabindra Nagar	trf	132kV	NER
	Gokul Nagar	trf	132kV	NER
	Monu	trf	132kV	NER
	Belonia	trf	132kV	NER
	Bagafa	trf	132kV	NER
	SABROOM	trf	132kV	NER
	MOHANPUR (HEZAMARA)	trf	132kV	NER
	SATCHAND	trf	132kV	NER
	Amarpur	trf	132kV	NER
	S/S Augmentation & transformer replacement			NER
	Kailashahar (Gournagar)		132kV	NER
	UDAIPUR		132kV	NER
	Ambasa		132kV	NER

Sl. No.	Scheme /details	Type	Voltage level	Region
	Dhalabil(Khowai)		132kV	NER
	JIRANIA		132kV	NER
NER - 8	**System Strengthening Scheme (World Bank) in Meghalaya (Tranche-I)**		Scheme	NER
	Killing (byrnihat) - Mawngap - New Shillong 220kV D/C line	D/C	220kV	NER
	LILO of both ckt of MLHEP-Khleriat 132kV D/c line at Mynkre	D/C	132kV	NER
	Phulbari - Ampati	D/C	132kV	NER
	New S/S			NER
	Mynkre	trf	132kV	NER
	Phulbari	trf	132kV	NER
	Mawngap (upgrading U/C 132 kV S/S to 220 kV GIS)	trf	220kV	NER
	New Shillong	trf	220kV	NER
	New Shillong	trf	132kV	NER
NER - 9	**System Strengthening Scheme (World Bank) in Nagaland (Tranche-I)**		Scheme	NER
	LILO of Mokokchung (Nagaland) - Mariani (Assam) 132kV D/c line at Longnak	D/C	132kV	NER
	New Kohima – Mon (Naginimora) routed via Wokha and Mokokchung (to be charged at 132kV)	S/C on D/C	220kV	NER
	Tuensang - Longleng	S/C on D/C	132kV	NER
	New Kohima (Zadima) - New Secretariat Complex	D/C	132kV	NER
	LILO of Kohima-Wokha Line at new Kohima	D/C	132kV	NER
	LILO of Kohima – Meluri(Kiphire) 132kV D/c line at Pfutsero	2xD/C	132kV	NER
	Wokha – Mokokchung(Nagaland) routed via Zunheboto	S/C on D/C	132kV	NER
	New S/S			NER
	LONGNAK	trf	132kV	NER
	LONGLENG	trf	132kV	NER
	NEW SECRETARIAT COMPLEX KOHIMA (NEW) SUBSTATION	trf	132kV	NER
	Pfutsero	trf	132kV	NER
	ZUNHEBOTO	trf	132kV	NER
	S/S Augmentation & transformer replacement			NER
	Wokha	trf	132kV	NER
NER - 10	**Namrup +Ext (100 MW) (state sector)**		Scheme	NER
	1. LILO of Namrup –Tinsukia 220kV S/C line at Bodubi	D/C	220kV	NER
	1.Tuirial-Kolasib 132 kV S/c (operated at 33 kV) - (existing)	S/C	132kV	NER

Sl. No.	Scheme /details	Type	Voltage level	Region
	2. LILO of Jiribam-Aizwal 132 kV S/c at Tuirial HEP	D/C	132kV	NER
NER - 11	**NER System Strengthening-V**		Scheme	NER
	5. Surajmaninagar (TSECL) – Surajmaninagar (TBCB) 132kV line with high capacity / HTLS	D/C	132kV	NER
	6. P.K.Bari (TSECL) – P.K.Bari (TBCB) 132kV D/c line with high capacity / HTLS	D/C	132kV	NER
NER - 12	**NER System Strengthening-VI**		Scheme	NER
	6. New Mariani-Mariani 220kV D/c line (high capacity Conductor)	D/C	220kV	NER
	7. Establishment of 220/132kV, 2x160MVA substation at Khumtai	trf	220kV	NER
	8. LILO of Samaguri – New Mariani 220kV 2xS/c lines at Khumtai	2xS/C	220kV	NER
	9. New Kohima (400/220kV TBCB) – New Kohima (220/132kV - Nagaland) 220kV D/c line with high capacity / HTLS conductor	D/c	220kV	NER
NER - 13	**NER System Strengthening-VII**		Scheme	NER
	LILO of Silchar-Byrnihat 400 kV line at Sonapur S/s	D/C	400kV	NER
	2x80 MVAR bus reactors at Sonapur	reactor	400kV	NER
	Establishment of 2x315 MVA 400/220 kV S/s at Sonapur S/s	trf	400kV	NER
	Misa-Shankardeb Nagar 220 kV D/C line	D/C	220kV	NER
	132 kV Imphal (PG)-Yurembam 132 kV D/C line with high capacity conductor using ROW of existing 132 kV Imphal (PG)-Yurembam 132 kV S/C MSPCL line along with up gradation / modification of bay equipment at both ends.	D/C	132kV	NER
NER - 14	**Loktak Downstream**		Scheme	
	Loktak DS - Rengpang 132 kV D/c	D/C	132kV	NER
	Loktak DS - Ningthoukhong 132 kV D/c	D/C	132kV	NER
NER - 15	**Manipur intrastate system**		Scheme	
	Thoubal S/S	trf	400kV	NER
	Imphal-Thoubal	D/C	400kV	NER
NER - 15	**Nagaland intrastate system**		Scheme	
	LILO of one circuit of Misa-Dimapur 220 kV D/C line at New Kohima	D/C	220kV	NER
	220/132 kV New Kohima S/S	trf	220kV	NER
NR - 1	**ATS for Tidong-I (100 MW)**		Scheme	NR
	2x315 MVA (7x105 MVA units) 220/400 kV GIS Pooling Station at Jangi (with 4000 Amps. switchgear) (with space provision for 3rd ICT)	D/C	220kV	NR
	Tidong – Jangi Pooling Station 220 kV D/c line		220kV	NR
NR - 2	**ATS for Sorang(100 MW)**		Scheme	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	LILO of S/c Karcham Wangtoo - Abdullapur 400kV line at Sorang	D/C	400kV	NR
NR - 3	**ATS for Sawara Kuddu (110 MW)**		Scheme	NR
	LILO of NathpaJhakri-Abdullapur 400kV D/c line at 400/220 PS by HPPTCL	2xD/C	400kV	NR
	1. Sainj-Sainj Village(HPPTCL) 132kV D/c line	D/C	132kV	NR
	2. LILO of 400kV Parbathi-II- Parbathi pooling point S/c line	D/C	400kV	NR
	3. Establishment of 400 / 132 kV S/s (2X315 MVA) Pooling Station by HPPTCL	trf	400kV	NR
NR - 4	**ATS for Nabha - Rajpura TPS (2x700 MW)**		Scheme	NR
	1. Creation of 400/220 kV S/S near Nabha/Patiala with 2X315 MVA Transformers	trf	400kV	NR
	2. Muktsar - substation near Jullundhur 400 kV D/C via Tarantaran	D/C	400kV	NR
	3. Creation of 400/220 kV S/S near Tarantaran	trf	400kV	NR
	4. Nabha/Patiala - S/S near Jullundhur 400 kV D/C via Mohali	D/C	400kV	NR
	5. Creation of 400/220 kV S/S near Mohali	trf	400kV	NR
	6. Interconnection between 400 kV S/S near Jullundhur to Jullundhur S/S (PG)	D/C	400kV	NR
	7. Interconnection between 400 kV S/S near Taran Taran to Amritsar S/S (PG)	D/C	400kV	NR
NR - 5	**ATS for Talwandi Sabo (3x660 MW)**		Scheme	NR
	1. Talwandi Sabo - Muktsar 400kV D/c line	D/C	400kV	NR
	2. Muktsar - Patti – Nakodar 400kV D/c line	D/C	400kV	NR
	5. Establishment of 2X315 MVA Muktsar S/s	trf	400kV	NR
	6. Establishment of 2X315 MVA Patti S/s	trf	400kV	NR
NR - 6	**ATS for Govindwal Saheb (2x270 MW)**		Scheme	NR
	1. Gowindwal sahib - Ferozpur 220 kV D/c	D/C	220kV	NR
	2. Gowindwal sahib - Khasa (Amritsar) 220 kV D/c	D/C	220kV	NR
	3. Gowindwal sahib - Sultanpur Lodhi 220 kV D/c	D/C	220kV	NR
	4. Gowindwal sahib - Kapurthalahasa 220 kV D/c	D/C	220kV	NR
NR - 7	**Composite System for ATS for Chhabra TPSSt-2 (500 MW) &Kalisindh (1200 MW)**		Scheme	NR
	1. Phagi (Jaipur South) 3000 MVA, 765/400kV S/S along with two sets of 765kV, 3x80 MVAR line reactors and 400kV 1x125 MVAR bus reactor		765kV	NR
	2. 400/765 kV GSS at Anta (Baran) pooling Station with with two sets of 765kV, 3x80 MVAR line reactors		765kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	4. 400/220kV S/S GSS at Ajmer		400kV	NR
	6. Chhabra – Anta Pooling Point at 400kV D/C (quad) line(for Chhabra TPS)	D/C	400kV	NR
	7. Phagi (Jaipur south) – Ajmer 400kV D/C line	D/C	400kV	NR
	8. Phagi (Jaipur south) –Heerapura 400kV D/C line	D/C	400kV	NR
	9. LILO of 220kV Ajmer – Beawer line at Ajmer(400/220kV) GSS.	D/C	220kV	NR
	10. LILO of 220kV Ajmer – Kishangarh line at Ajmer(400/220kV) GSS.	D/C	220kV	NR
	11. Kalisindh – Jhalawar 220kV D/C line (for Kalisindh TPS)	D/C	220kV	NR
NR - 8	**ATS for Tapovan Vishnugarh(520MW)**		Scheme	NR
	1. Tapovan Vishnugarh HEP- Site of 400/220 Pipalkoti Switching station 400kV D/c line	D/C	400kV	NR
	2. Site of Pipalkoti Switching stn - srinagar 400kV D/c line	D/C	400kV	NR
NR - 9	**ATS for Singoli Bhatwari (99 MW)**		Scheme	NR
	LILO of Baramwari – Srinagar 220kV D/c line at Singoli Bhatwari	D/C	220kV	NR
NR - 10	**ATS for Phata Byong (76 MW)**		Scheme	NR
	Baramwari-Srinagar 220kV D/c line	D/C	220kV	NR
NR - 11	**Srinagar (330 MW) (Private Sevtor)**		Scheme	NR
	1. Srinagar - Kashipur 400kV D/c line	D/C	400kV	NR
	2. Srinagar-HEP - Srinagar 400kV D/c line	D/C	400kV	NR
NR - 12	**Combined ATS for Bara TPS(1980MW), Karchana (1320MW) & Meja JV(1320MW)**		Scheme	NR
	1. Step-up of Bara generation to 765kV	bay	765kV	NR
	2. Bara switchyards to have 765kV and 400kV levels with 2x1500MVA (7x500 MVA, 1 phase units) 765/400 ICTs.	trf	765kV	NR
	3. Establishment of 400kV substation at Reewa Road Allahabad with 400/220kV 2x315 MVA ICTs	trf	400kV	NR
	4. Step-up of Karchana and Meja generation to 400kV	bay	400kV	NR
	5. LILO of 400kV Obra-Panki line at Reewa Road Allahabad	D/C	400kV	NR
	6. Meja – Bara 400kV quad D/C line	D/C	400kV	NR
	7. Meja – Reewa Road (Allahabad) 400kV quad D/C line	D/C	400kV	NR
	8. Karchana – Bara 400kV quad D/C line	D/C	400kV	NR
	9. Karchana – Reewa Road Allahabad 400kV quad D/C line	D/C	400kV	NR
	10. Bara-Mainpuri 765kV 2xS/C lines	2xS/C	765kV	NR
	11. Mainpuri –G. Noida 765kV S/C	S/C	765kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	12. LILO of Agra - Meerut 765 kV S/C line of PGCIL at G. NOIDA	S/C	765kV	NR
	13. Hapur – G.Noida 765kV S/C line	S/C	765kV	NR
	14. New 765/400kV substation at Maipuri with 2x1000MVA (7x333 MVA, 1 phase units) ICTs	trf	765kV	NR
	15. Mainpuri 765kV UPPCL – Mainpuri 400kV PGCIL 400kV quad D/C line	D/C	400kV	NR
	16. New 765/400 substation at G.Noida with 2x1500MVA (7x500MVA, 1 phase units) 765/400kV	trf	765kV	NR
	17. 2x315MVA 400/220kV ICTs at New 765/400kV substation at G.Noida	trf	400kV	NR
	18. Reewa Road Allahabad – Banda 400kV quad D/C line	D/C	400kV	NR
	19. Banda – Orai 400kV quad D/C line	D/C	400kV	NR
	20. Orai – Mainpuri 765kV UPPCL 400kV quad D/C line	D/C	400kV	NR
	21. Establishment of 400kV substation at Banda with 400/220kV 2x315 MVA ICTs	trf	400kV	NR
	22. Establishment of 400kV substation at Orai with 400/220kV 2x315 MVA ICTs	trf	400kV	NR
	23. Meja-Allahabad(PG) 400kV D/c line	D/C	400kV	NR
	24. Unnao-Mainpuri 765kV S/c line	D/C	400kV	NR
	25. Mainpuri-Hapur 765kV S/c line	D/C	400kV	NR
	26. Mainpuri – Aligarh 400 kV Quad D/c line	D/C	400kV	NR
	27.Tanda-Gonda 400 kV Quad D/c line	D/C	400kV	NR
	28. Gonda-Shahjahanpur 400 kV Quad D/c line	D/C	400kV	NR
	29. LILO of Sarojininagar-Kursi Road line at Sultanpur Road 400kV Twin Moose	D/C	400kV	NR
	30. LILO of Obra-Sultanpur line at Aurai 400 kV Twin Moose	D/C	400kV	NR
	31.G.Noida - Sikanderabad line 400kV D/c Quad	D/C	400kV	NR
	32.G.Noida - Noida (Sector-148) line 400kV D/c Quad	D/C	400kV	NR
	33.Hapur - Dasna 400 kV D/c Quad Moose line	D/C	400kV	NR
	34.Hapur - Ataur 400 kV D/c Quad Moose line	D/C	400kV	NR
	35.LILO of Muradabad (PG)-Muradnagar(PG) 400 kV D/c Quad Moose line at Hapur	D/C	400kV	NR
	36.LILO of Muradnagar-Muzzafarnagar 400 kV D/c Quad Moose line at Atuar	D/C	400kV	NR
	37.LILO of Rishikesh-Kashipur 400 kV D/c Quad Moose line (PTCUL) at Nehtur	D/C	400kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	38.Establishment of 400kV substation at Gonda with 400/220kV 2x315 MVA ICTs	trf	400kV	NR
	39.Establishment of 400kV substation at Gonda with 220/132 kV 2x100 MVA ICTs	trf	220kV	NR
	38.Establishment of 400kV substation at Sultanpur road, Lucknow with 400/220kV 2x500 MVA ICTs	trf	400kV	NR
	39.Establishment of 400kV substation at Sultanpur road,Lucknow with 220/132 kV 2x160 MVA ICTs	trf	220kV	NR
	40.Establishment of 400kV substation at Aurai with 400/132 kV 2x200 MVA ICTs	trf	400kV	NR
	41.Establishment of 765kV substation at Hapur with 765/400 kV 2x1500 MVA ICTs	trf	765kV	NR
	42.Establishment of 400kV substation at Hapur with 400/220 kV 2x 500 MVA ICTs	trf	400kV	NR
	43.Establishment of 400kV substation at Ataur with 400/220 kV 2x500 MVA ICTs	trf	400kV	NR
	44.Establishment of 400kV substation at Ataur with 220/33 kV 3x60 MVA ICTs	trf	220kV	NR
	45.Establishment of 400kV substation at Sikandrabad with 400/220 kV 2x500 MVA ICTs	trf	400kV	NR
	46.Establishment of 400kV substation at Nehtur with 400/132 kV 2x200 MVA ICTs	trf	400kV	NR
	47.Establishment of 400kV substation at Dasna with 400/132 kV 2x315 MVA ICTs	trf	400kV	NR
	48.Establishment of 400kV substation at Dasna with 220/132kV 2x100 MVA ICTs	trf	220kV	NR
	49.Establishment of 400kV substation at Indirapuram with 400/220 kV 2x500 MVA ICTs	trf	400kV	NR
	50.Establishment of 400kV substation at Indirapuram with 220/33kV 3x60 MVA ICTs	trf	220kV	NR
NR - 13	**Lalitpur TPS (3x660 MW) (State Sector) (tentative)**		Scheme	NR
	1. Lalitpur – Agra –I 765kV S/C line (385km)	S/C	765kV	NR
	1. Lalitpur – Agra –I 765kV S/C line (385km)	S/C	765kV	NR
	4. Lalitpur 765/220kV S/S (2x300) MVA	trf	765kV	NR
	5. Establishment of 765/400 kV, 2x1500 MVA, Agra (UP) substation	trf	765kV	NR
	6. Establishment of 400/132 kV, 2x300 MVA Agra (South) substation	trf	400kV	NR
	7. LILO of one circuit of existing 400kV Agra (UP) – Agra (PG) 2xS/C line at 765/400 kV Agra (UP) (10 Km)		400kV	NR
	8.LILO of existing 400 kV Agra (UP) – Muradnagar S/C line at Agra (UP) 765/400 kV substation	S/C	400kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	9. Jhasi- Lalitpur – lalitpur switchyard 220kV D/C line (2x50 km)	D/C	220kV	NR
NR - 14	**Anpara D (1000 MW) (State Sector)**		Scheme	NR
	1. Anpara B - Anpara D 400 kV D/c line	D/C	400kV	NR
	2. Anpara C - Anpara D 765 kV S/c line	S/C	765kV	NR
	3. Anpara D - Unnao 765 kV S/c line	S/C	765kV	NR
	4. Anpara D 765 / 40o kV S/S (2x600 + 1000) MVA	trf	765kV	NR
NR - 15	**Solar & New Wind Power Projects in Rajsthan(2650 MW) [Solar - 1400 MW; Wind - 1250 MW)**		Scheme	NR
	1. 400/220 kV, 3 X 500 MVA and 220/132kV, 3x160 MVA with 132/33kV, 2x40/50 MVA Pooling Sub-Station GSS at Ramgarh (Jaisalmer) alongwith 400kV, 1x125 MVAR, Bus Reactor and 2x50 MVAR line Reactor for 400kV D/C Ramgarh-Bhadla line	trf	400kV	NR
	2. 400/220 kV, 3 X 315 MVA and 220/132kV, 3x160 MVA with 132/33kV, 2x40/50 MVA Pooling Sub-Station GSS at Bhadla (Jodhpur) alongwith 400kV, 1x125 MVAR Bus Reactor and 4x50 MVAR, 400kV Line Reactors for Bhadla ends of 400kV D/C Bhadla-Bikaner line, 400kV LILO Jodhpur-Merta at Bhadla.	trf	400kV	NR
	3. Augmentation of 400kV GSS Akal by installation of 400/220 kV, 1 X 500 MVA Transformer alongwith 400kV, 2x50 MVAR Shunt Reactor (line type) for proposed 400kV Akal-Jodhpur (New) D/c line, and 1x125 MVAR 400 kV Bus Reactor.	trf	400kV	NR
	Augmentation of 400kV GSS Jodhpur (New)			NR
	(i) 2x50 MVAR, 400kV Shunt Reactor (line type) at 400kV GSS Jodhpur (New) for 400kV D/C Akal-Jodhpur(New) line	reactor	400kV	NR
	(ii) 400kV bays at Jodhpur (New) for LILO of both ckt. of 400kV D/C Raj West LTPS-Jodhpur line.	bay	400kV	NR
	Augmentation at 400kV GSS Barmer			NR
	(i) 1x125 MVAR, 400kV Shunt Reactor (Bus type) at 400kV GSS Barmer	reactor	400kV	NR
	(ii) 400kV bays for 400kV D/C Barmer-Bhinmal (PG) line	bay	400kV	NR
	Augmentation at 400kV GSS Bikaner			NR
	(i) 400kV Bays for 400kV D/C Bhadla-Bikaner line and 400kV D/C Bikaner-Sikar (PGCIL) line at Bikaner end of the lines	bay	400kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(ii) 1x125 MVAR, 400kV Shunt Reactor (Bus type) at 400kV GSS Bikaner	reactor	400kV	NR
	7. 400kV Interconnecting Lines :		400kV	NR
	(i) 400 kV D/C Ramgarh(Jaisalmer)-Akal (Jaisalmer) line (Twin Moose)	D/C	400kV	NR
	(ii) 400 kV D/C Ramgarh-Bhadla line (Twin Moose)	D/C	400kV	NR
	(iii) 400 kV D/C Bhadla-Bikaner line (Quad Moose)	D/C	400kV	NR
	(iv) 400 kV D/C line from 400/220kV Pooling Station Bhadla to LILO point at 400kV S/C Jodhpur-Merta line (Twin Moose)	D/C	400kV	NR
	(v) 400 kV D/C Bikaner-Sikar (PGCIL) line (Twin Moose)	D/C	400kV	NR
	(vi) 400 kV D/C Barmer-Bhinmal (PGCIL) line (Twin Moose)	D/C	400kV	NR
	(vii) LILO of both circuits of 400kV D/C Raj West-Jodhpur line at 400kV GSS Jodhpur (New) (Twin Moose)	D/C	400kV	NR
	(viii) 400kV D/C Akal-Jodhpur (New) line (Quad Moose	D/C	400kV	NR
	220kV GSS at Bap and associated lines:			NR
	(i) 220/132kV, 2x160 MVA	trf	220kV	NR
	(ii) 132/33kV, 2x40/50 MVA ICT	trf	132kV	NR
	(iii) LILO of 220kV Barsingsar LTPS-Phalodi line at at Bap	D/C	220kV	NR
	(iv) 220kV D/C Bap-Bhadla line	D/C	220kV	NR
	220kV GSS at Kanasar and associated lines:			NR
	(i) 220/132kV, 2x160 MVA ICT	trf	220kV	NR
	(ii) 132/33kV, 2x40/50 MVA ICT	trf	132kV	NR
	(ii) 220kV D/C Bhadla- Kanasar line	D/C	132kV	NR
	(iii) LILO of 132kV PS1-PS2 line at proposed 220kV GSS at Kanasar	D/C	132kV	NR
	(iv) LILO of 132kV PS2-PS3 line at proposed 220kV GSS at Kansar	D/C	132kV	NR
	10. Up-gradation of PS No. 2 to 132kV Grid Substation with 132/33kV, 2x20/25 MVA Transformers with associated 132kV line	trf	132kV	NR
	11. Up-gradation of PS No. 3 to 132kV Grid Substation with 132/33kV, 2x20/25 MVA Transformers	trf	132kV	NR
	12. Charging of 132 kV line from PS_No.5 to PS_No.1 on 132 kV voltage level via 132 kV PS_No.2 GSS , 132 kV PS_No.3 GSS and 132kV PS_No.4 GSS		132kV	NR
	14. Up-gradation of PS No. 4 to 132kV Grid Substation with 132/33kV, 2x20/25 MVA Transformers	trf	132kV	NR
NR - 16	**ATS for Kotlibhel St-1 (215 MW)**		Scheme	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Kotlibhel-Srinagar 220 kV D/c	D/C	220kV	NR
NR - 17	**ATS for Tehri-II (1000MW)**		Scheme	NR
	400/220/132kV Hardoi Road Substation (UPPTCL)		400kV	NR
	400/220/132kV Hardoi Road Substation (UPPTCL)		220kV	NR
	LILO of one circuits of Lucknow (PG)-Unnao 400kV D/C lines at Hardoi Road (UP)	D/c	400kV	NR
	Provision of LILO of both circuits of Lucknow(PG) –Kanpur 400kV D/C line at Hardoi Road (UP) substation in future	D/c	400kV	NR
	Provision of 125MVAr bus reactor at Hardoi Road	Reactor		NR
	400/220V Landhora Substation by PTCUL			NR
	400/220kV, 2x500 MVA Landhora Substation with LILO of one circuit of 400kV D/C Kashipur – Puhana line in stages		400kV	NR
	LILO of 220 kV Ramnagar (Roorkee) – Nara S/C line at Landhora substation (19.67 km)	D/c	220kV	NR
	220/33kV, 2x50MVA new substation to feed the loads in Laksar and Manglore Area along with 220kV connectivity with Landhora S/s.		220kV	NR
	To construct Sultanpur substation as 220/66 kV or 220/33kV, 2x 50 MVA instead of 2x40, 132 MVA in order to cater the growing load demand of Sultanpur Area along with 220kV connectivity with Landhora S/s.		220kV	NR
NR - 18	**Transmission Elements uder GEC for Himachal Pradesh**		Scheme	NR
	132 kV D/C Line from Tangnu Romai to 132/220 kV Sunda P.S	D/C	132kV	NR
	132/220 kV, 2x100 MVA GIS sub station at Dehan		132kV	NR
	220 kV D/C Line between Dehan and 400/220 kV sub station at Hamirpur (PGCIL)	D/C	220kV	NR
	132 kV D/C Line from Rupini to 132/220 kV Sunda P.S		132kV	NR
	66/220 kV, 80/100 MVA sub station at 132/220 kV Sunda sub station			NR
	Providing additional 132/220 kV, 100 MVA Transformer at 132/220 kV, 100 MVA GIS sub station at Charor (ADB funded) in Distt. Kullu	Xmer	132kV	NR
	33/220 kV sub station at Heling by LILO of 220 kV Bvajoli Holi- Lahal D/C line		220kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Additional 400/220 kV, 315 MVA transformer in the yard of 400/220 kV, 1x315 MVA GIS sub station at Pragatinagar	Xmer	400kV	NR
	Providing additional 33/132 kV, 31.5 MVA Transformer at 33/132 kV, 31.5 MVA GIS sub station at Pandoh in Distt. Mandi	Xmer	132kV	NR
	Construction of 33/132 kV, 2x31.5 MVA GIS sub station near Malana-II (100 MW) power house in Distt. Kullu.		132kV	NR
	Construction of 33/132 kV, 2x31.5 MVA GIS sub station Sarsadi by LILO of one circuit of 132 kV Barsaini-Charor D/C line in Distt. Kullu		132kV	NR
NR - 19	**Transmission Elements under GEC for Rajasthan**		Scheme	NR
	Construction of 400/220kV GSS at Jaisalmer-2 alongwith 2 Nos. bays at Barmer and 1 No. bay at Akal on Turnkey basis.		400kV	NR
	Construction of 400kV D/C Jaisalmer -2 - Barmer line - 130kms.	D/C	400kV	NR
	Construction of 400kV D/C Barmer - Bhinmal(PGCIL) line-140kms.	D/C	400kV	NR
	Construction of 400kV S/C Jaisalmer -2 - Akal Line -50kms.	S/C	400kV	NR
	Construction of 220/132kV GSS at Kolayat alongwith 220kV extension Bays at existing 220kV GSS at Gajner on Turnkey basis.		220kV	NR
	Construction of 220/132kV GSS at Chatrail alongwith 2 Nos. 220kV extension Bays at 400/220kV GSS at Ramgarh on Turnkey basis.		220kV	NR
	Construction of 220/132kV GSS at Undoo alongwith 220kV extension Bays at 220kV GSS at Pokaran on Turnkey basis.		220kV	NR
	Construction of 220/132kV GSS at Pokaran on Turnkey basis		220kV	NR
	Construction of 220/132kV GSS at PS-1/Bajju alongwith 2 Nos. 220kV extension Bays at 400/220kV GSS at Bhadla on Turnkey basis		220kV	NR
	220 KV D/C Gajner (U/C 220 KV GSS)-Kolayat line	D/C	220kV	NR
	LILO of existing 132 KV S/C Kolayat-Bajju line at proposed 220 KV GSS Kolayat	S/C	132kV	NR
	LILO of existing 132 KV S/C PS1-Bajju line at proposed 220 KV GSS PS_1 / Bajju	S/C	132kV	NR
	LILO of both circuits of U/C 220 KV D/C Ramgarh GTPP – Dechu line at Pokaran (5kM D/C each x 2 = 10kM D/C)	D/C	220kV	NR
	LILO of existing 132 KV S/C Chandan-Pokaran line at proposed 220 KV GSS Pokaran	S/C	132kV	NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	220 kV D/C interconnection at proposed 220 kV GSS Undoo to 220 kV GSS Pokaran	D/C	220kV	NR
	132 kV D/C interconnections at proposed 220 kV GSS Undoo	D/C	132kV	NR
	Construction of 5x20/25 MVA, 132/33 kV GSSs 132 kV D/C lines around 220 kV GSSs as per solar potential in respective areas	D/C	132kV	NR
NR - 20	**1x660 MW Panki Extension TPS Power**		Scheme	NR
	Generation Transformer 21/400 kV			NR
	Panki TPS – Panki 400 kV D/C line			NR
NR - 21	**1x660 MW Harduaganj TPS**		Scheme	NR
	G.T 21/400 kV at Harduaganj Extn.			NR
	LILO of one ckt of Aligarh-Sikandrabad 400 kV D/C line (Isolux line) at Harduaganj TPS-			NR
	400/220 kV, 2x315 MVA ICT at Harduaganj Extn.			NR
NR - 22	**2x660 MW Obra "C" TPS**		Scheme	NR
	G.T. 21/765 kV at Obra "C"			NR
	2x1500 MVA 765/400 kV ICT at Obra "C"			NR
	LILO of Anpara "D" – Unnao 765 kV S/C line at Obra "C"			NR
	Obra "C" – Jaunpur 400 kV D/C line			NR
	LILO of one ckt of Obra C – Jaunpur 400 kV D/C line at Obra (Existing			NR
NR - 23	**2x660 MW Jawaharpur (Etah) TPS**		Scheme	NR
	Evacuation at 765 kV with G.T. 21/765 kV			NR
	LILO of Mainpuri – Greater Noida 765 kV S/C line at Jawaharpur TPS			NR
	765/400 kV, 2x1500 MVA ICT at Jawaharpur TPS			NR
	400/220 kV, 2x500 ICT at Jawaharpur TPS			NR
	Creation of Firozabad 400/220/132 kV 2x500, 2x160 MVA substation			NR
	Jawaharpur TPS – Firozabad 400 kV D/C line			NR
	Firozabad – Agra South 400 kV D/C			NR
	Etah – Jawaharpur TPS 220 kV D/C			NR
	Jawaharpur TPS – Sirsaganj 220 kV D/C			NR
	765/400/220 kV substations at Modipuram (Meerut):			NR
NR - 24	**Construction of 765/400 kV, 2x1500 MVA; 2x500 MVA, 400/220 kV Modipuram (Meerut) S/S**		Scheme	NR
	Hapur – G. Noida 765kV S/C line at Modipuram (Meerut)			NR
	Modipuram (765kV) – Simbholi 400 kV D/C line			NR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Modipuram (765kV) – Shamli (400 kV) D/C			NR
	Modipuram – Baghpat 400 kV D/C line			NR
NR - 25	**765/400/220 kV S/s Moradabad:**		Scheme	NR
	Construction of 765/400 kV, 2x1500 MVA; 2x500 MVA, 400/220 kV substation at Moradabad.			NR
	LILO of approved Ghatampur TPS – Hapur 765kV S/C line at Moradabad.			NR
	Moradabad (765 kV) – Sambhal 400 kV D/C line			NR
	Moradabad (765 kV) – Moradabad 400 kV D/C line			NR
	Creation of 400/220 kV, 2x500 MVA S/s Sambhal.			NR
NR - 26	**400/220/132 Kv Ss Firozabad:**		Scheme	NR
	Creation of 400/220 kV, 2x500 MVA, 2x160 MVA 220/132kV Firozabad.			NR
	Firozabad – Jawaharpur TPS 400 kV D/C line			NR
	Firozabad (400 kV) – Agra South 400 kV D/C line			NR
	Firozabad (400 kV) – Tundla 220 kV D/C line			NR
	Firozabad (400kV) – Firozabad 220 kV D/C line			NR
NR - 27	**400/220 kV 2x315 MVA Badaun:**		Scheme	NR
	Construction of 2x315 MVA, 400/220 kV substation at Badaun			NR
	Roza TPS – Badaun 400 kV D/C line			NR
	Badaun – Sambhal 400 kV D/C line			NR
NR - 28	**400/220 kV S/s Jaunpur:**		Scheme	NR
	Construction of 2x500 MVA, 400/220 kV substation at Jaunpur.			NR
	Obra"C" – Jaunpur 400 kV D/C line			NR
	Varanasi (765 kV) PGCIL – Jaunpur 400 kV D/C line			NR
NR - 29	**400/220/132 kV Rasra (Mau):**		Scheme	NR
	Construction of 2x500 MVA, 400/220 kV; 2X160 MVA, 220/132 kV substation at Rasra (Mau)			NR
	LILO of one ckt of Balia – Mau 400 kV D/C line at Rasra			NR
	Balia (PGCIL) – Rasra 400 kV S/C line			NR
NR - 30	**400/220/132 kV Simbholi:**		Scheme	NR
	Construction of 2x500 MVA, 400/220 kV; 2X160 MVA, 220/132 kV substation at Simbholi			NR
	Modipuram (765 kV) – Simbholi 400 kV D/C line			NR
	Simbholi – Moradnagar –II 400 kV D/C line			NR

Sl. No.	Scheme /details	Type	Voltage level	Region
NR - 31	**400/220/132 kV Sambhal:**		Scheme	NR
	Construction of 2x500 MVA, 400/220 kV; 2X160 MVA, 220/132 kV substation at Sambhal			NR
	Badaun – Sambhal 400 kV D/C line			NR
	Moradabad – Sambhal 400 kV D/C line			NR
NR - 32	**Pipalkoti HEP (444 MW):**		Scheme	NR
	Establishment of 400 kV Pipalkoti switching station (Proposed site) in timeframe of Pipalkoti HEP			NR
	400kV D/C (Twin Moose) Pipalkoti HEP–Pipalkoti switching station (Proposed site) line			NR
	400kV D/C (Twin Moose) Realignment of Tapovan Vishnugad HEP–Pipalkoti S/stn (Proposed site) line at Pipalkoti switching station			NR
	Realignment of 400kV D/C (Quad) Pipalkoti Substation – Srinagar line to Pipalkoti switching station.			NR
NR - 33	**Evacuation system of Ghatampur (Kanpur) 3x660 MW TPS**		Scheme	NR
	21/765 kV Generator Transformers 400/132kV ICTs at Ghatampur TPS			NR
	Ghatampur TPS –Agra (UP) 765kV S/C Line			NR
	Agra (UP) -Greater Noida (UP) 765kV S/C Line			NR
	Ghatampur TPS - Hapur 765 kV S/C Line			NR
	Ghatampur TPS – Kanpur (PG) 400 kV D/C line			NR
NR - 34	**LILO of one ckt. of NAPP - Khurja 220 kV DC line at 220 kV Debai (UPPTCL) S/S**		Scheme	NR
	NAPP-Atrauli 220 kV S/C line		220	NR
	NAPP-Sambhal 220 kV S/C line		220	NR
	NAPP-Simbhauli 220 kV S/C line		220	NR
SR - 1	**ATS for Lower Jurala U1-6(6X40MW)**		Scheme	SR
	1. 220Kv Lower Jurala HEP switchyard-220/132Kv Jurala S/S D/C line	D/C	220kV	SR
	2. 400Kv Veltoor -220Kv Jurala S/S ,220Kv D/C line	D/C	220kV	SR
SR - 2	**ATS for Rayalseema St -III (U-6)**		Scheme	SR
	1. RSTPP Generation Switchyard- Chittoor 4ookV D/C line	D/C	400kV	SR
SR - 3	**ATS for Torangallu Jindal U3(300MW) (Private Sector)**		Scheme	SR
	1. Torangallu JSW -Gooty 400kV D/C line	D/C	400kV	SR
SR - 4	**ATS for Thottiar HEP (2X80MW)**		Scheme	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	1. Generation to be stepped up to 220kV for evacuation		220kV	SR
	2. upgrading the existing 110kV Kodakara S/S to 220kV		220kV	SR
	3. 220kV D/C line from switchyard to Kodakara S/S	D/C	220kV	SR
	4. LILO of Idukki-Kozikode 220kVS/C line Kodakara	D/C	220kV	SR
SR - 5	**ATS for Pallivasal HEP (60 MW) Evacuation at lower level**		Scheme	SR
	8. Salem - Madhugiri 765kV S/c line	S/C	765kV	SR
SR - 6	**Wind projects in Tamil Nadu Phase I**		Scheme	SR
	1. Kanaraptty (TN Wind) - Kayathar 400 KV, 400 kV D/C Twin Moose line.	D/C	400kV	SR
	2. Kayathar - Karaikudi 400 kV D/C Quad line	D/C	400kV	SR
	4. Establishment of Kayathar S/s with (a) 2x315 MVA 400/230 kV ICT	trf	400kV	SR
	4. (b) 2x200 MVA 400/110kV ICT	trf	400kV	SR
	6. Tirunelveli (TNEB) (TN wind/Kanarapatty) 400/230 kV S/S (3x315 MVA)	trf	400kV	SR
	7. Tirunelveli (TNEB) - Tirunelveli (PG) 400kV D/c quad line	D/C	400kV	SR
	8. Five numbers of 230/33 kV wind energy substations at Marandai, Sayamalai, Vagaikulam, Kumarapuram, Sankaralingapuram and one 230/110 kV Samugarangapuram substation with associated 230 kV lines connecting with the Kanarpatti 400 kV S/S. **This system was planned in 2007 for completion in 11th Plan. The system is yet to be completed.	trf	220kV	SR
SR - 7	**Wind projects in Tamil Nadu Phase-II**		Scheme	SR
	1. Thappagundu 400/110 KV (5x200MVA) S/s in Theni area	trf	400kV	SR
	2. Anaikadavu S/s in Udumpet area with 400/230 kV, 2x315 MVA	trf	400kV	SR
	2. (b) 400/110 kV, 2x200 MVA ICT	trf	400kV	SR
	3. Rasipalayam S/s in Udumalpet area with (a) 400/230 kV, 2x315 MVA ICT	trf	400kV	SR
	3. (b) 400/110 kV, 2x200 MVA ICT	trf	400kV	SR
	4. Anaikadavu- Rasipalayam 400kV D/c line.	D/C	400kV	SR
	5. Thappagundu- Anaikadavu 400kV D/c with one ckt LILO at Udumalpet 400/220 kV (PGCIL) substation.	D/C	400kV	SR
	6. Rasipalayam -Singarapet 400kV 2xD/c line	2xD/C	400kV	SR
	7. Vagrai S/s with 400/230 kV, MVA ICT	trf	400kV	SR
	7. (b) 400/110 kV, MVA ICT	trf	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	8. Vagrai-Rasipalayam 400 kV D/c line	D/C	400kV	SR
	9. (a) Thennampatti 400/230 kV substation	trf	400kV	SR
	9 (b) 400/110 kV, MVA ICT	trf	400kV	SR
	10. Thennampatti - Kayathar 400kV D/C line	D/C	400kV	SR
SR - 8	**System for additional inter-connection with ISTS and increased reliability**		Scheme	SR
	1. LILO of one Rasipalayam -Singarapet 400kV D/c line at Salem 765/400kV (POWERGRID) substation	D/C	400kV	SR
SR - 9	**Wind projects in Andhra Pradesh (3150 MW)**		Scheme	SR
	1. 400/220 kV Substation at Hindupur (3x315MVA)	trf	400kV	SR
	2. 400/220 kV Substation at Kondapuram (4x315MVA)	trf	400kV	SR
	3. 400/220 kV Substation at Uravakonda (4x315MVA)	trf	400kV	SR
	4. Uravakonda-Mahbubnagar 400 kV Quad DC Line	D/C	400kV	SR
	5. Uravakonda-Hindupur 400 kV DC Line	D/C	400kV	SR
	6. Uravakonda-Kondapur 400 kV DC Line	D/C	400kV	SR
	7. Kondapur – Kurnool 400kV quad DC line	D/C	400kV	SR
	8. Hindupur (400kV) S/S -Hindupur/ Gollapuram(existing) 220kV DC line	D/C	220kV	SR
	9. Urvakonda (400kV) S/S - Kalyandurg(existing) 220kV D/C line	D/C	220kV	SR
	10. Kondapur (400kV) S/S - Tadipatri(existing) 220kV D/C line	D/C	220kV	SR
	11. 220/132 kV, 2x100 MVA Substation at Jammalamadugu	trf	220kV	SR
	12. 220/132 kV, 2x100 MVA Substation at Penukonda	trf	220kV	SR
	13. 220/132 kV, 2x100 MVA Substation at Porumamilla	trf	220kV	SR
	14. Connectivity of Jammalamadugu, Penukonda and Porumamilla 220/1323kv S/s with existing 132/33kV S/Ss		220kV	SR
SR - 10	**Wind projects in Karnataka (400 MW)**		Scheme	SR
	1. LILO of Munirabad - Davangere (Guttur) 400 kV S/C line at Doni	D/C	400kV	SR
SR - 11	**Evacuation for Yeramaras(2x660 MW) and Edalapur (1X800 MW) Stg-I**		Scheme	SR
	1. Establishment of Bellary 400kV pooling station near 'BTPS'		400kV	SR
	2. Establishment of Gulbarga 400/220 kV substation 7x167 MVA(single phase) or 2x500 MVA.	trf	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	3. Yermarus TPS - Gulbarga 400 kV D/C line with quad moose conductor	D/C	400kV	SR
	4. Establishment of Establish 400 KV switching station at Chikkanayakanahalli (C.N Halli) near “Loop in Loop Out” (LILO) point on the Nelamangala – Talaguppa 400kV lines to Hassan	D/C	400kV	SR
	5. LILO of both the circuits of Nelamangala – Talaguppa 400kV lines to the proposed pooling station near CN Halli	D/C	400kV	SR
	6. Terminate 400kV D/C line feeding 400/220 KV station at Hassan from Nelamangala – Talaguppa line at CN Halli 400kV pooling station	D/C	400kV	SR
	7. Yermarus TPS - Bellary Pooling Station 400kV D/C line with quad moose conductor	D/C	400kV	SR
	8. Bellary Pooling Station - C.N.Hally 400kV D/C line with quad moose conductor	D/C	400kV	SR
	9. Bellary Pooling Station - New Madhugiri (near Tumakur) 765/400kV station, 400kV D/C line with quad moose conductor	D/C	400kV	SR
	10. Bellary TPS – Bellary Pooling Station 400kV D/C line with quad moose conductor	D/C	400kV	SR
	11. De-link 400kV S/C line running between RTPS-BTPS-JSW-Guttur with ‘BTPS’ and JSW Bus so as to retain direct connectivity between RTPS and Guttur	D/C	400kV	SR
	12.JSW TPS – Bellary Pooling Station 400kV D/C line with quad moose conductor	D/C	400kV	SR
SR - 12	**Evacuation for Yeramaras(2x660 MW) and Edalapur (1X800 MW) Stg-II**		Scheme	SR
	1. Edlapur TPS - Bellary Pooling Station 400kV D/C line with quad moose conductor	D/C	400kV	SR
	2. Edlapur TPS - Yermarus TPS 400kV D/C line with quad moose conductor	D/C	400kV	SR
	3. Tumakur (New Madhugiri) - Bastipura (Mysore) 400kV D/C line with quad moose conductor	D/C	400kV	SR
SR - 13	**ATS FOR ETPS EXPANSION – 1X660MW**		Scheme	SR
	1. 400kV DC Quad connectivity from ETPS Expansion switchyard to the 765/400kV Pooling station at North Chennai. (Generation at 400kV level)	D/C	400kV	SR
	2. 1X125 MVAR,420kV Bus Reactor at generation switchyard.	reactor	400kV	SR
SR - 14	**ATS FOR ENNORE SEZ (NCTPS Stage-IV) – 2X660MW**		Scheme	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	1. 400kV DC Quad connectivity from Ennore SEZ switchyard to the 765/400kV Pooling station at North Chennai. (Generation at 400kV level)	D/C	400kV	SR
	2. 400kV DC Quad inter link between the ETPS Expansion and Ennore SEZ switchyard for reliability.		400kV	SR
	3. 2X125MVAR, 420kV Bus Reactors at generation switchyard	reactor	400kV	SR
SR - 15	**ATS FOR NCTPS Stage III – 1X800MW**		Scheme	SR
	1.765kV DC line from NCTPS Stage III switchyard to the North Chennai Pooling station. (Generation at 765kV level)	D/C	765kV	SR
	2. 1X240MVAR,765kV Bus Reactor at generation switchyard	reactor	765kV	SR
SR - 16	**ATS FOR ETPS Replacement – 1X660MW**		Scheme	SR
	1.765kV DC line from ETPS Replacement switchyard to North Chennai Pooling station. (Generation at 765kV level)	D/C	765kV	SR
	2.765kV DC inter link to NCTPS Stage-III for reliability.		765kV	SR
	3.1X240MVAR, 765kV Bus Reactor at generation switchyard.	recator	765kV	SR
SR - 17	**ATS for M/S.OPG Power generation Ltd.- 2X360MW : (By OPG)**		Scheme	SR
	1. 400kV DC line to the North Chennai Pooling station.	D/C	400kV	SR
	2. 2X80 MVAR ,420kV Bus Reactor at the generation switchyard.	reactor	400kV	SR
SR - 18	**Common Transmission system for above generation projects in Chennai area**		Scheme	SR
	Establishment of 765/400kV Pooling Station in North Chennai area			SR
	1. 765kV DC line from North Chennai 765kV pooling station to Ariyalur 765/400kV SS	D/C	765kV	SR
	2. Second 765kV DC line from North Chennai 765kV pooling station to Ariyalur 765/400kV SS	D/C	765kV	SR
	3. 1x240 MVAR, 765kV switchable line reactors in each line at both ends	Reactor	765kV	SR
	4. 400kV DC line from North Chennai Pooling station to Pulianthope 400/230kV SS	D/C	400kV	SR
	5. 500MVA, 400/400kV Phase Shifting transformer (PST) at the Pooling station to control the power flow on the Pooling station – Pulianthope 400kV DC line	PST	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Establishment of 765/400kV Sub Station in Ariyalur (near Villupuram)			SR
	1. 2X1500MVA, 765/400kV ICTs	trf	765kV	SR
	2. 765kV DC line from Ariyalur 765/400kV SS to the Thiruvalam PGCIL 765/400kV SS.	D/C	765kV	SR
	3. 1x240 MVAR, 765kV switchable line reactors in each line at both ends	Reactor	765kV	SR
	4. LILO of both the circuits of Pugalur – Kalivantapattu 400kV DC Quad line at Ariyalur	D/C	400kV	SR
	5. 2X240MVAR, 765kV Bus Reactor at 765kV bus of Ariyalur 765/400kV SS	Reactor	765kV	SR
	6. Provision for 420kV bus reactor at 400kV bus	Reactor	400kV	SR
	Establishment of 765/400kV SS in Coimbatore Region			SR
	1. 2X1500MVA, 765/400kV ICTs	trf	765kV	SR
	2. 765kV DC line to Ariyalur 765/400kV SS	D/C	765kV	SR
	3. 240 MVAR, 765kV switchable line reactors in each line at both ends	Reactor	765kV	SR
	4. Provision for bus reactor at 400kV bus for future requirement	Reactor	400kV	SR
	ATS for proposed power plants at Udangudi (2x660 MW + 1x 800MW)			SR
	1. 400kV DC Quad line from Udangudi to the Kayathar 400kV SS	D/C	400kV	SR
	2. 400kV DC line from Udangudi to Samugarengapuram 400/230-110 kV SS	D/C	400kV	SR
	3. 400kV Quad DC line from Udangudi to Ottapidaram 400/230-110kV SS	D/C	400kV	SR
	4. Ottapidaram 400/230-110 kV Substation with 2x 315MVA, 400/230kV ICTs	trf	400kV	SR
	5. 2x200 MVA, 400/110 kV ICTs.	trf	400kV	SR
	6. 400 kV DC Quad line from Ottapidaram to Udangudi Switchyard	D/C	400kV	SR
	7. 400 kV D/C Quad line from Ottapidaram to Kamuthi 400/230-110 kV Substation	D/C	400kV	SR
	8. LILO of TSipcot – Kavanoor 230kV SC line at Ottapidaram	S/C	220kV	SR
	9. 230kV DC line from Udangudi to Indbharath generation switchyard (2x150 MW)	D/C	220kV	SR
	10. LILO of TSipcot – Savasapuram 230kV SC feeder at Ottapidaram	S/C	220kV	SR
	11. Kamuthi 400/230-110 kV Substation for Solar Power injection with 3x 315MVA 400/230kV ICTs	trf	400kV	SR
	12. 2x200 MVA, 400/110kV ICTs	trf	400kV	SR
	13. 400 kV DC Quad line from Kamudhi SS to Karaikudi 400kV PGCIL SS	D/C	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	14. 230kV DC line from Kamudhi SS to Muthuramalingapuram 230kV SS.	D/C	220kV	SR
	15. 230kV DC line from Kamudhi SS to Kavanoor 230kV SS	D/C	220kV	SR
SR - 19	**A.Establishment of Samugarengapuram 400/230-110 KV Substation**		Scheme	SR
	1. Samugarengapuram 400/230-110 KV wind Substation with 2x 315MVA,400/230kV ICTs	trf	400kV	SR
	2. 2x200 MVA, 400/110kV ICTs	trf	400kV	SR
	3. 400 kV D/C line from Udangudi Switchyard	D/C	400kV	SR
	4. LILO of Kudankulam – SRPudur 230kV SC line	S/C	220kV	SR
	5. LILO of Udayathur – Sankaneri 230kV SC line	S/C	220kV	SR
	6. 230kV DC line to proposed Muppandal 230kV SS	S/C	220kV	SR
	B.Establishment of Padukottai 400/230-110 KV Substation			SR
	1. Pudukottai 400/230-110 kV Substation with 2x 315MVA,400/230kV ICTs	trf	400kV	SR
	2. 2x200 MVA, 400/110kV ICTs	trf	400kV	SR
	3. LILO of both 400kV Karaikudi – Pugalur TANTRANSCO DC Quad line	D/C	400kV	SR
	4. 230kV SC line to Karambium 230kV SS	S/C	220kV	SR
	5. 230kV SC line to Pudukottai 230kV SS	S/C	220kV	SR
	6. 230kV SC line to Tuvakudi (BHEL) 230kV SS	S/C	220kV	SR
	C.Establishment of Turaiyur 400/230-110 KV Substation			SR
	1. Turaiyur 400/230 kV Substation with 2x 315MVA, 400/230kV ICTs	trf	400kV	SR
	2. LILO of one of the NLC – Pugalur 400 kV PGCIL line at Turaiyur	S/C	400kV	SR
	3. 400 kV D/C line from Turaiyur to Mangalapuram 400 kV Substation	D/C	400kV	SR
	4. 230kV SC line to Perambalur 230kV SS	S/C	220kV	SR
	5. 230kV SC line to Samayapuram 230kV SS	S/C	220kV	SR
	6. 230kV SC line to sanctioned Jambunathapuram 230kV SS	S/C	220kV	SR
	7. 230kV SC line to the sanctioned Poyyur 230kV SS	S/C	220kV	SR
	D.Establishment of Kolapalur 400/230-110 KV Substation			SR
	1. Kolapalur 400/230-110 kV Substation with 2x 315MVA,400/230kV ICTs	trf	400kV	SR
	2. 2x200 MVA, 400/110kV ICTs	trf	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	3. LILO of one of the 400 kV MTPS Stage	S/C	400kV	SR
	III – Karamadai TANTRANSCO line at Kolapalur		400kV	SR
	4. 400 kV D/C line from Kolapalur to Rasipalayam 400 kV Substation	D/C	400kV	SR
	5. 230kV SC line from Karmadai to Thingalur 230kV SS	S/C	220kV	SR
	6. 230kV SC line from Karmadai to Anthiyur 230kV SS	S/C	220kV	SR
	7. 230kV SC line from Karmadai to Shenbagapudur 230kV SS	S/C	220kV	SR
	8. LILO of Gobi – Pallakapalayam 230kV feeder	S/C	220kV	SR
	9. LILO of Karamadai – Ingur 230kV line at Karmadai	S/C	220kV	SR
	E.Establishment of Managalapuram 400/230-110 KV Substation			SR
	1. Mangalapuram 400/230 KV Substation with 2x 315 MVA, 400/230 kV ICTs	trf	400kV	SR
	2. LILO of both the Ariyalur – Pugalur 400 kV D/C Quad line at Mangalapuram	D/C	400kV	SR
	3. LILO of Salem – Singapuram 230kV SC line at Mangalapuram	D/C	220kV	SR
	4. LILO of Deviakurichi – Valayapatty 230 kV feeder at Mangalapuram	D/C	220kV	SR
	5. 230 kV SC line from Mangalapuram to Thammampatty 230 kV SS	S/C	220kV	SR
	6. 230 kV SC line from Mangalapuram to Udayapatty 230 kV SS	S/C	220kV	SR
	F.Establishment of Sholingur 400/230-110 KV Substation			SR
	1. Sholingur 400/230-110 KV Substation with 2x 315MVA, 400/230 kV ICTs	trf	400kV	SR
	2. 2x200 MVA, 400/110kV ICTs	trf	400kV	SR
	3. LILO of Sriperumbudur- Tiruvalam - Kolar 400 kV S/C PGCIL line. (In between Sriperumbudur & Tiruvalam 400kV Substation)	D/C	400kV	SR
	4. LILO of Thiruvalam – Mosur 230 kV feeder at Sholingur	S/C	220kV	SR
	5. LILO of SVChatram – Arni 230 kV feeder at Sholingur	S/C	220kV	SR
	6. 230 kV DC line from Sholingur to Pattaraiperumbudur 230 kV SS	D/C	220kV	SR
	G.Establishment of Pulianthope 400/230-110 KV Substation			SR
	1. Pulianthope 400/230 kV Substation with 3x 315MVA, 400/230kV ICTs	trf	400kV	SR
	2. 400 kV DC Quad line from Pulianthope to North Chennai Pooling Station	D/C	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	3. 400 kV DC line from Pulianthope to Manali 400/230-110 kV Substation	D/C	400kV	SR
	4. 230 kv SC cable link to Tondiarpet 230 kV SS	S/C	220kV	SR
	5. 230 kv SC cable link to Basinbridge 230 kV SS	S/C	220kV	SR
	6. 230 kv SC cable link to Vysarpadi 230 kV SS	S/C	220kV	SR
	7. 230 kv SC cable link to CMRL Central 230kV SS	S/C	220kV	SR
	H.Establishment of Mylapore 400/230-110 KV Substation			SR
	1. Mylapore 400/230 kV Substation with 2x 315MVA, 400/230 kV ICTs	trf	400kV	SR
	2. 400 kV SC cable from Mylapore to Pulianthope 400/230 kV SS	S/C	400kV	SR
	3. 400 kV SC cable from Mylapore to Guindy 400 kV SS	S/C	400kV	SR
	I.Establishment of Palavadi 400/230-110 KV Substation			SR
	1. Palavadi (Singarapet) 400/230-110 KV Substation		400kV	SR
	2. 400 kV DC quad line from Singarapet to MTPS Stage III	D/C	400kV	SR
	3. 400 kV DC quad line from Singarapet to Tiruvalam 400 KV SS	D/C	400kV	SR
	4. 400 kV quad 2XDC line from Singarapet to Rasipalayam 400 kV Substation	2xD/C	400kV	SR
	5. LILO of Karimangalam - MALCO 230kV SC line at Singarapet	S/C	220kV	SR
	6. 230kV line from Singarapet to Gurubarahally 230kV SS.	S/C	220kV	SR
	7. 230kV DC line from Singarapet to Udanapally 230kV SS	D/C	220kV	SR
	Kayathar – Koilpatty (Tuticorin Pooling point) 400kV DC Quad line	D/C		SR
	1. Kayathar – Koilpatty (Tuticorin Pooling point) 400kV DC Quad line	D/C	400kV	SR
	Pavoorchatram 400kV SS (Tennampatty 400kV SS)			SR
	1. LILO of Kodikurichi – Veeranam 230kV line at Pavoorchatram	D/C	220kV	SR
	2. Establishment of Pavoorchatram 400kV S/s	trf	400kV	SR
SR - 20	**System Strengthening in Tamil Nadu**		Scheme	SR
	1. Establishment of new 230/110kV, 3x160 MVA or 4x100 MVA S/S at Neyveli (by TNEB)	trf	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	2. Shifting of the 230kV (3 nos) and 110kV(7 nos) lines owned by TNEB emanating from the existing Neyveli TS-I switchyard to Neyveli 230kV SS (by TNEB)		220kV	SR
	3. LILO of both circuits of Neyveli TS-I – Neyveli TS-II 230kV DC line at NNTPS Switchyard (by NLC)	D/C	220kV	SR
	4. NNTPS switchyard – Neyveli(TANTRANSCO 230kV S/S), 230kV DC line with HTLS conductor (by TNEB)	D/C	220kV	SR
	5. Neyveli TPS-II - Neyveli(TANTRANSCO 230kV S/S), 230kV D/C line with HTLS conductor (by TNEB)	D/C	220kV	SR
	6. 2x500 MVA ICTs at Villupuram (Ginjee) 400kV S/S	trf	400kV	SR
SR - 21	**Raigarh-Pugalur Scheme under Tamil Nadu scope**		Scheme	SR
	1. Establishment of 400/220kV substation with 2x500 MVA transformers at Edayarpalayam	trf	400kV	SR
	2. 2x125 MVAR bus reactors at Edayarpalayam	Reactor	400kV	SR
SR - 22	**Transmission Scheme for Solar Power Park at Ghani/Panyam (1000 MW)**		Scheme	SR
	Phase-I Works:			SR
	1) 400/220kV Substation at Gani/Panyam – 3x500 MVA.	Trf	400kV	SR
	2) 400kV QMDC Line from Kurnool to proposed 400kV Gani/Panyam SS.	D/C	400kV	SR
	3) 400kV Bay Extensions at Kurnool SS – 2 Nos.	bays	400kV	SR
	Phase-II works :			SR
	4) 400kV QMDC Line from Jammalamadugu/ Kondapuram to the proposed 400kV Gani/Panyam SS	D/C	400kV	SR
SR - 23	**Transmission Evacuation Scheme for 1000MW Wind Power at Aspiri**		Scheme	SR
	1) 400/220kV Substation with 3x315 MVA	Trf	400kV	SR
	2) 400kV QMDC line from Aspiri to 400kV Uravakonda SS.	D/C	400kV	SR
SR - 24	**Transmission Evacuation Scheme for Manuguru (4x270 MW) TPS**		Scheme	SR
	i) Manuguru TSGENCO plant switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose 400 kV DC line.	D/C	400kV	SR
	ii) 1x125 MVAR Bus reactor at Manuguru switchyard	Reactor	400kV	SR
SR - 25	**Transmission Evacuation Scheme for Kothagudem VII(1x800MW) TPS**		Scheme	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	i) KTPS Stage VII switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose 400kVDC line.	D/C	400kV	SR
	ii) 1x125 MVAR Bus reactor at KTPS Stage VII switchyard	Reactor	400kV	SR
SR - 26	**Common transmission system for Manuguru(4x270 MW) TPS and Kothagudem VII(1X800MW) TPS**		Scheme	SR
	1-From proposed 400/220kV Bommanapalli SS to upcoming Suryapet 400/220/132kV SS by Quad Moose 400kV DC line	DC	400kV	SR
	2-From proposed 400/220kV Bommanapalli SS to proposed 400/220kV Jangaon SS by Quad Moose 400kV DC line –about 120kms	DC	400kV	SR
	3-From proposed 400/220kV Jangaon SS to proposed 400kV Tippapur LI SS by Quad Moose 400kV DC line –about 70kms.	DC	400kV	SR
	4-From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Kallur SS by Single Moose 220kV DC line-about 70kms	DC	220kV	SR
	5-From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Pedagopathi SS by Single Moose 220kV DC line-about 110kms	DC	220kV	SR
	6-From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Bommanapalli SS by Single Moose 220kV DC line	DC	220kV	SR
	7-From Proposed 400/220 kV Jangaon SS to Upcoming 220/132 kV Jangaon SS by Single Moose 220kV DC Line – about 15 kms	DC	220kV	SR
	8-From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Husnabad SS by Single Moose 220kV DC Line – about 60 kms	DC	220kV	SR
	9-From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Bhongiri SS by Single Moose 220kV DC Line – about 70 kms	DC	220kV	SR
SR - 27	**Damaracherla Transmission Scheme**		Scheme	SR
	a) Proposed Damaracherla Switchyard to Proposed 400/220/132 kV Choutuppal SS by Quad Moose Dc Line	D/C	400kV	SR
	b) Proposed Damaracherla Switchyard to Proposed 400/220kV DindiSS by Quad Moose Dc Line	D/C	400kV	SR
	c) Proposed Damaracherla Switchyard to Proposed 400/220 kV Maheswaram(TSTRANSCO) SS by Quad Moose Dc Line	D/C	400kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	d) Proposed Damaracherla Switchyard to Proposed 400/220kV Jangaon SS (Jangaon SS is included in the Manuguru and KTPS VII Evacuation Scheme) by Quad Moose Dc Line	D/C	400kV	SR
	e) From Proposed 400/220/132 kV Choutuppal SS to Upcoming 220/33 kV Hayatnagar SS by Single Moose DC Line	D/C	220kV	SR
	f) From Proposed 400/220/132 kV Dindi SS to Upcoming 220/33 kV Thimmajipet SS by Single Moose DC Line	D/C	400kV	SR
	g) From Proposed 400/220/132 kV Dindi SS to proposed 220/132 kV Nagarkurnool SS by Single Moose DC Line	D/C	220kV	SR
	h) From Proposed 400/220/132 kV Dindi SS to Existing 220/33 kV KM Pally SS by Single Moose DC Line	D/C	400kV	SR
	i) 400/220 kV Dindi SS with 3 x 500 MVA	Trf	400kV	SR
	j) 400/220/132 kV Choutuppal SS with 3 x500 MVA+2 x 100 MVA	Trf	400kV	SR
	j) 400/220/132 kV Choutuppal SS with 3 x500 MVA+2 x 100 MVA	Trf	400kV	SR
	k) 220/132 kV Nagarkurnool SS with 2x100 MVA	Trf	220kV	SR
SR - 28	**Transmission system for i) evacuation of power from 1 x 800 MW VTS Extnplant of APGENCO at Vijayawada**		Scheme	SR
	a) 400kV VTS- Sattenpalli Quad Moose DC line.	D/C	400kV	SR
	b) 1x125MVAR Bus reactor at VTPS Extn.	Reactor	400kV	SR
SR - 29	**Transmission system for evacuation of power from 400kV ring main around the proposed capital city of Andhra Pradesh**		Scheme	SR
	I) Elluru 400/220 kV substation, 2x315 MVA (To be upgraded to 765 kV with Pudimadaka) :			SR
	i) Keep provision for 400/220 kV transformer with 2x500 MVA rating for future use.	Trf	400kV	SR
	ii) Existing 132 kV Elluru to be upgraded to 220kV and will be connected with Elluru 400/220kV S/S.	SS	220kV	SR
	iii) Provision of D/C 220kV outlet from Elluru 220kV S/S.	D/C	220kV	SR
	iv) LILO of Vemagiri-I Sattenpali 400 kV DC twin lines at Elluru 400 kV substation.	D/C	400kV	SR
	v) LILO of Vemagiri-Nunna 220kV DC line at 220/132kV Elluru.	D/C	220kV	SR
	vi) LILO of Elluru(existing)-Pedavegi 132kV at proposed 220/132kV Elluru SS.	D/C	132kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	vii) 1x125MVAR Bus reactor at Elluru 400/220 kV substation	Reactor	400kV	SR
	II) Gudivada 400/220/132 kV, 2x500 MVA substation.			SR
	i) LILO of existing Nunna- Guduwada 220kVDC line at Gudiwada 400/220/132kV.	D/C	220kV	SR
	ii) LILO of 220kV Gudiwada- Gudiwada 400/220/132kV DC line at Gannavaram.	D/C	220kV	SR
	iii) Gudiwada 400/220/132kV-Machhlipatnam 220kV DC line.	D/C	220kV	SR
	iv) Elluru - Gudivada 400 kV DC Quad line.	D/C	400kV	SR
	v) Gudivada – C Peta 400 kV DC Quad line.	D/C	400kV	SR
	vi) 1x125MVAR Bus reactor at Gudivada 400/220/132 kV substation	Reactor	400kV	SR
	III) Sattenpalli 400/220kV S/S			SR
	i) 2 x 315 existing transformer to be augmented by 2 x 500 MVA substation.	Trf	400kV	SR
	ii) Sattenpalli- Guntur 220kV DC line.	D/C	220kV	SR
	iii)1x125MVAR Bus reactor at Sattenpalli 400/220kV S/S	Reactor	400kV	SR
	IV) 400/220kV substation at CPeta by APTRANSCO – as a new substation close to 765/400kV CPeta (under ISTS) or as 400kV bus extension at proposed 765/400kV CPeta (ISTS) for erecting CPeta 400/220 kV, 2x500 MVA transformer			SR
	i) CPeta 220/132kV, 2x100 MVA S/S.	Trf	220kV	SR
	ii) 220kV DC line from CPeta 220/132kV to CPeta 400/220 kV.	D/C	220kV	SR
	iii) 2 nos of 220kV DC line for future from CPeta 400/220 kV	D/C	220kV	SR
	iv) LILO of Sattenpali - VTS 400 kV DC line at Inavolu	D/C	400kV	SR
	v) 132 kV LILO (10.5 KM approx.) of existing 132 kV Chilakaluripeta – Nallapadu at proposed 220/132 kV Chilakaluripet SS	D/C	132kV	SR
	vi) 132 kV LILO (10.5 KM approx.) of existing 132 kV Chilakaluripeta – Marripalem at proposed 220/132 kV Chilakaluripet SS.	D/C	132kV	SR
	vii) 1x125MVAR Bus reactor at 400/220kV substation at CPeta	Bus Reactor	400kV	SR
	V) Inavolu 400/220 kV, 2x500 MVA substation.			SR
	i) Existing 132/33kV Tadepalli to be upgraded to 220/132/33 kV Tadepalli and further 220kV DC line to Inavolu.	D/C	220kV	SR
	ii) 220kV DC line to Malkapuram.	D/C	220kV	SR
	iii) 220kV DC line to Amravati.	D/C	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	iv) Erection of 220/132/33 kV Amaravathi SS with 2 x 160 MVA PTRs.	Trf	220kV	SR
	v) 220 kV DC line (14 KM) from proposed 400/220 kV Inavolu SS to proposed 220/132/33 kV Amaravathi SS.	D/C	220kV	SR
	vi) 220 kV LILO (4 KM) of existing 3rd circuit of VTS – Tallapalli line at proposed 220/132/33 kV Amaravathi SS.	D/C	220kV	SR
	vii) Erection of 220/132/33 kV Malkapuram SS with 2 x 100 MVA PTRs.	Trf	220kV	SR
	viii) 220 kV DC line (6 KM) from proposed 400/220 kV Inavolu SS to proposed 220/132/33 kV Malkapuram SS.	D/C	220kV	SR
	ix) 220 kV DC line (12 KM) from proposed 220/132/33 kV Tadepalli SS to proposed 220/132/33 kV Malkapuram SS.	D/C	220kV	SR
	x) 220 kV DC LILO (5 KM) of existing VTS – Podili line at proposed 220/132/33 kV Malkapuram SS.	D/C	220kV	SR
	xi) Up-gradation of 132/33 kV Repalle SS to 220/132/33 kV Repalle SS with 2 x 100 MVA PTRs.	Trf	220kV	SR
	xii) 220 kV DC line (60 KM) from proposed 220/132 kV Guntur-2 SS to proposed 220/132/33 kV Repalle SS.	D/C	220kV	SR
	xiii) Erection of 132/33 kV Amaravathi SS with 2 x 50 MVA PTRs.	Trf	132kV	SR
	xiv) 132 kV DC line (5 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Amaravathi SS.	D/C	132kV	SR
	xv) Erection of 132/33 kV Achampeta SS with 2 x 50 MVA PTRs.	Trf	132kV	SR
	xvi) 132 kV DC line (32 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Achampeta SS.	D/C	132kV	SR
	xvii) Erection of 132/33 kV Dondapadu SS with 2 x 50 MVA PTRs.	Trf	132kV	SR
	xviii) 132 kV DC/SC line (15 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Dondapadu SS.	DC/SC	132kV	SR
	xix) 132 kV DC/SC line (11 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Dondapadu SS.	DC/SC	132kV	SR
	xx) Erection of 132/33 kV Peddaparimi SS with 2 x 50 MVA PTRs.	Trf	132kV	SR
	xxi) 132 kV DC/SC line (19 KM) from proposed 220/132/33 kV Amaravathi SS to proposed 132/33 kV Peddaparimi SS.	DC/SC	132kV	SR
	xxii) Erection of 132/33 kV Navuluru SS with 2 x 50 MVA PTRs.	Trf	132kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	xxiii) 132 kV DC/SC line (12 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Navuluru SS.	DC/SC	132kV	SR
	xxiv) 132 kV DC/SC line (16 KM) from proposed 132/33 kV Peddaparimi SS to proposed 132/33 kV Navuluru SS.	DC/SC	132kV	SR
	xxv) Erection of 132/33 kV Uddandrayanipalem SS with 2 x 50 MVA PTRs.	Trf	132kV	SR
	xxvi) 132 kV DC/SC line (3 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Uddandrayanipalem SS.	DC/SC	132kV	SR
	xxvii) 132 kV DC/SC line (7 KM) from proposed 132/33 kV Dondapadu SS to proposed 132/33 kV Uddandrayanipalem SS.	DC/SC	132kV	SR
	xxviii) Erection of 132/33 kV Krishnayanipalem SS with 2 x 50 MVA PTRs.	Trf	132kV	SR
	xxix) 132 kV DC/SC line (6 KM) from proposed 220/132/33 kV Malkapuram SS to proposed 132/33 kV Krishnayanipalem SS.	DC/SC	132kV	SR
	xxx) 132 kV DC/C line (3 KM) from proposed 132/33 kV Navuluru SS to proposed 132/33 kV Krishnayanipalem SS.	DC/SC	132kV	SR
	xxxi) 1x125MVAR Bus reactor at Inavolu 400/220 kV S/s	Reactor	400kV	SR
SR - 30	**Power supply under VCIC (Vizag Chennai Industrial Corridor) scheme**		Scheme	SR
	I) For Sricity SEZ :			SR
	i) Up-gradation of 220/132KV Rachagunneri SS to 400/220/132KV SS Rachagunneri with 2 x 315 MVA.	Trf	400kV	SR
	ii) 400KV QMDC LILO of (45KM) 400KV SS Chittoor – 400KV APGENCO Krishnapatnam.	D/C	400kV	SR
	iii) Up-gradation of 132/33KV Cherivi SS to 220/132/33KV Chervi SS with 2 x 160 MVA.	Trf	220kV	SR
	iv) Erection of 220 KV DC line (50KM) from 400KV SS Rachagunneri to 220KV SS at Chervi in Chittoor district.	D/C	220kV	SR
	v) Erection of 220KV DC line (30KM) from 220KV SS Sulluripet to 220KV SS Chervi in Chittoor District.	D/C	220kV	SR
	vi) Erection of 132/33KV SS at Yerpedu with 2 x 80MVA.	Trf	132kV	SR
	vii) Erection of 132KV DC line (5KM) from 400/220/132KV SS at Rachagunneri SS to proposed 132KV Yerpedu SS.	D/C	132kV	SR
	II) APIIC SEZ :			SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	i. Up-gradation of existing 132/33 kV Menakuru SS to 220/132/33 kV Menakuru SS with 2 x 100 MVA PTRs.	Trf	220kV	SR
	ii. 220 kV DC line (40 KM) from proposed 400/220/132 kV Rachagunneri SS to proposed 220/132/33 kV Menakuru SS.	D/C	220kV	SR
	iii. 132 kV LILO (15 KM) of existing 132 kV Naidupet – Gudur line to proposed 220/132/33 kV Menakuru SS.	D/C	132kV	SR
	Group – I Transmission schemes of KPTCL for renewable energy generation projects			SR
	1. Establishing 2 x 500 MVA, 400/ 220 kV Sub station at Gadag(Doni) in Mundaragi Taluk, Gadag District.			SR
	(i) Establishing 2 x 500 MVA, 400/ 220 kV Sub station at Gadag(Doni) in Mundaragi Taluk, Gadag District.	Trf	400kV	SR
	(ii) Construction of 400 kV LILO line with Twin Moose ACSR conductor from 400 kV Guttur-Guddadahalli SC line to Proposed 400/220 kV S/S at Gadag(Doni) for a distance of 26.798 kms in Gadag District.	S/C	400kV	SR
	(iii) Construction of 220 kV DC LILO line from 220 kV Gadag-Lingapur DC line to proposed 400/220 kV Gadag(Doni) S/S for a distance of 2.775 Kms in Mundaragi Taluk, Gadag District	S/C	220kV	SR
	2. Construction of 220 kV SC line from 400kV Hiriyur (PGCIL) sub station to 220/66/11kV Hiriyur sub station and Construction of 220kV DC line from 220/66/11kV Chitradurga sub station to 220/66/11kV Hiriyur sub station in existing corridor in Chitradurga District.			SR
	(i) Construction of 220 kV SC line on DC towers from existing 400kV PGCIL station Beerenahalli to existing 220/66/11kV SRS at Hiriyur in Chitradurga Dist in existing corridor of 220kV SC line from Hoysalakatte to 220/66/11 kV sub station Hiriyur (partly in new corridor i.e from PGCIL point to link 220 kV S/C line from Hoysalakatte to 220/66/11kV SRS at Hiriyur)	S/C	220kV	SR
	(ii) Construction of 220 kV DC line on DC towers from existing 220/66 kV Sub-Station Chitradurga to existing 220/66 kV Sub-Station Hiriyur in Chitradurga Dist in existing corridor (partly in new corridor from LILO point to 220 kV sub station Chitradurga) for a distance of 37.461Kms.	D/C	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(iii) Construction of Two Nos of 220 kV Terminal bays at 220/66/11 kV Chitradurga Sub-Station in Chitradurga Taluk and District.	Bays	220kV	SR
	(iv) Construction of Two Nos of 220 kV Terminal bays at 220/66/11 kV Hiriyur Sub-Station in Hiriyur Taluk and Chitradurga District.	Bays	220kV	SR
	3. Establishing 2 x 500 MVA, 400/220 kV Sub station at Jagalur in Jagalur Taluk, Davanagere District.			SR
	(i) Establishing 2 x 500 MVA, 400/220 kV GIS Sub station at Jagalur in Jagalur Taluk, Davanagere District.	Trf	400kV	SR
	(ii) Construction of 400kV Multi circuit Quad Moose ACSR line for a length of 40kms from proposed 400/220kV Jagalur substation to LILO the proposed BTPS-CNHalli DC line at the rate of Rs.350.00Lakhs per km.	M/C	400kV	SR
	(iii) Construction of 220kV Drake ACSR line for a length of 40kms from proposed 400/220kV Jagalur substation to 220/66kV Thallak substation at the cost of Rs.60.00Lakhs per km.	SC	220kV	SR
	(iv) Construction of 220kV Drake ACSR line for a length of 50kms from proposed 400/220kV Jagalur substation to proposed 220/66/11kV Kudligi substation at the cost of Rs.60.00Lakhs per km.	D/C	220kV	SR
	(v) Construction of 4Nos of 220kV line terminal bays(2 Nos each at 220/66kV Thallak and prop 220/66/11kV Kudligi substations) at the cost of Rs:150.00 Lakhs per TB.	Bays	220kV	SR
	(vi) Construction of 220kV DC line for a route length of 50kms from Jagalur to Chitradurga at the cost of Rs.60.00 Lakhs per km	D/C	220kV	SR
	4. Construction of 220kV DC line for a length of 26kms from 220kV Bidnal substation to LILO one of the circuits of 220kV Narendra-Haveri DC line, in Haveri and Dharwad districts.			SR
	Group – II			SR
	5. Establishing 2x100MVA 220/66 kV and 1x8MVA 66/11kV sub station at Shivanasamudra, Malavalli taluk, Mandya district.			SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(i) Construction of 220kV DC line for a distance of 1.5kms to link to 220kV line connecting 220kV T.K.halli substation at the cost of Rs.60.00Lakhs per km.	D/C	220kV	SR
	(ii) Construction of 220kV DC line for a distance of 1.5kms to link to 220kV line connecting 220kV Madhuvanahalli substation at the cost of Rs.60.00Lakhs per km.	D/C	220kV	SR
	(iii) Construction of 220kV DC Drake ACSR line for a length of 76kms in the existing 220kV Hootagally-Vajamangala-T.K.Halli SC line corridor including LILO to 220/66/11kV Vajamangala substation at the cost of Rs.60.00 Lakhs per km	D/C	220kV	SR
	(iv) Construction of 220kV line terminal bays-4Nos (one each at 220kV Hootagally and T.K.halli and two nos at Vajamangala) at the cost of Rs.150.00 Lakhs per TB.	Bays	220kV	SR
	(v) Construction of 5kms of 66kV DC coyote ACSR lines to link M2 line,T.K.halli line,SFC line,Kollegala line,Madhuvanahalli lines to proposed 220/66/11kV Shivanasamudram substation near existing SFC substation at the cost of Rs.30.00Lakhs per kms.	D/C	66kV	SR
	(vi) Establishing 2x100MVA 220/66 kV and 1x8MVA 66/11kV sub station at Shivanasamudra, Malavalli taluk, Mandya district	Trf	220kV	SR
	6. Establishing 2 x 100 MVA, 220/110 KV & 1x10 MVA, 110/11 KV Sub station at Mughalkod in Raibag Taluk, Belgaum District.			SR
	(i) Establishing 2 x 100 MVA, 220/110 KV & 1x10 MVA, 110/11 KV Sub station at Mughalkod in Raibag Taluk, Belgaum District.	Trf	220kV	SR
	(ii) Construction of 110kV DC for a length of 5kms to link 220/110/11kV Mughalkod to 110/11kV Itnal substation at the rate of Rs.40 Lakhs per km.	D/C	110kV	SR
	(iii) Construction of 110kV DC for a length of 10kms to link 220/110/11kV Mughalkod to link to lines connecting Hidkal and Sultanpur substations at the rate of Rs.40 Lakhs per km.	D/C	110kV	SR
	(iv) Construction of 110kV DC for a length of 15kms to link 220/110/11kV Mughalkod to lines connecting Mudalagi and Hunsyal substations at the rate of Rs.40 Lakhs per km.	D/C	110kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(v) Construction of 110kV DC for a length of 15kms to link 220/110/11kV Mughalkod to lines connecting Kuligod and Saidapur substations at the rate of Rs.40 Lakhs per km.	D/C	110kV	SR
	(vi) Construction of 220kV DC line LILO Ghataprabha-Chikkodi for a route length of 40kms at a cost of Rs 60.00 Lakhs per km	D/C	220kV	SR
	Group – III			SR
	7- Establishing 2x100MVA 220/66 kV and 1x12.5MVA 66/11kV sub station at Hosadurga, Hosadurga taluk, Chitradurga district.			SR
	(i) Construction of 220kV DC line for a length of 45kms from proposed 220/66/11kV Hosadurga substation to 400/220kV CN Halli substation at the cost of Rs.60.00Lakhs per km.	D/C	220kV	SR
	(ii) Construction of 220kV line terminal bays-2Nos at 400/220kV CN Halli substation at the cost of Rs.150.00 Lakhs per TB	Bays	220kV	SR
	(iii) Construction of 66kV DC line for a length of 2kms from proposed 220/66/11kV Hosadurga substation to LILO 66kV SC Bagur-Ramagiri SC line at the cost of Rs.30.00Lakhs per km.	D/C	66kV	SR
	(iv) Construction of 66kV DC line for a length of 10kms from proposed 220/66/11kV Hosadurga substation to 66/11kV Hosadurga substation in existing corridor at the cost of Rs.30.00Lakhs per km.	D/C	66kV	SR
	(v) Construction of 66kV DC line for a length of 15kms from proposed 220/66/11kV Hosadurga substation to 66/11kV Halurameshwara substation in existing corridor at the cost of Rs.30.00Lakhs per km.	D/C	66kV	SR
	(vi) Establishing 2x100MVA 220/66 kV and 1x12.5MVA 66/11kV sub station at Hosadurga, Hosadurga taluk, Chitradurga district.	Trf	220kV	SR
	(vii) Construction of 2 Nos 66kV TBs at 66/11kV Halurameshwara(2 Nos) at the cost of Rs.35Lakhs per TB.	Bays	66kV	SR
SR - 31	**Transmission System for Tumkur (Pavgada) Ultra Mega Solar Park (2000MW)**		Scheme	SR
	Phase-I (1000MW)			SR
	Phase-II(1000MW)			SR
SR - 32	**2000 MW HVDC corridor to the State of Kerala**		Scheme	SR
	(i) 400kV Substations at Kottayam			SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	1. Four 400 kV Line bays	Bays	400kV	SR
	2. Six 220kV line bays	Bays	220kV	SR
	3. Two Transformer Bays with 2x315 MVA 400/220kV ICT's	Bays	400kV	SR
	4. LILO both circuits of 400kV Tirunelveli – Cochin East Quad Moose D/c feeder.	D/C	400kV	SR
	(ii) 400kV Substations at Kollam			SR
	1. Four 400kV Line bays	Bays	400kV	SR
	2. Six 220kV Line bays	Bays	220kV	SR
	3. two transformer bays with 2x315MVA	Bays	400kV	SR
	400/220kV ICT’s		400kV	SR
	4. LILO one circuit of 400kV Tirunelveli – Edamon – Cochin East Quad Moose D/c feeder	D/C	400kV	SR
	(iii) 400kV Substations at Edamon			SR
	1. Six 400kV Line bays		400kV	SR
	2. Four spare 400kV Line Bays		400kV	SR
	3. Two transformer bays with 2x315MVA 400/220kV ICT’s	Bays	400kV	SR
	4. LILO both circuits of under construction 400kV Tirunelveli – Cochin East Quad Moose D/c feeder	D/C	400kV	SR
	5. LILO of existing 400kV Tirunelveli – Trivandrum (North) Twin Moose D/c feeder	D/C	400kV	SR
	(iv) 400kV Substation at Kanhirode			SR
	1. 400kV S/s at Kanhirode with a transformer capacity of 2x315MVA	Trf	400kV	SR
	2.LILO the proposed 400kV Uduppi-Kasarkode(Mylatti) – Kazhikode D/C feeder	D/C	400kV	SR
	(v) 400kV Substation at Ettumanoor			SR
	1. 400kV S/s at Ettumanoor with a transformer capacity of 2x315MVA	Trf	400kV	SR
	2. LILO-ing the proposed 400kV Edamon – Cochin East D/C feeder	D/C	400kV	SR
	1. Projects planned under Green Corridor intra-State Scheme			SR
	(i) 220kV Substation at Kottathara, Palakkad Dt			SR
	a. 220/33kV, 2x100MVA transformers	Trf	220kV	SR
	b. Two 220kV and four 110kV line bays	Bays	220kV	SR
	c. Construction of a 220kV D/c line to the 220kV substation planned at Vettathur.	D/C	220kV	SR
	(ii) 220kV Substation at Vettathur, Palakkad Dt			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. Two 220kV and four 110kV line bays		220kV	SR
	c. LILO of existing 220kV Madakathara – Areekode feeder	D/C	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(iii) 220kV Substation Kuyilimala, Idukki Dt			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. Two 220kV line bays.	Bays	220kV	SR
	c. LILO of 220kV Pallivasal – Idukki feeder	D/C	220kV	SR
	2- Projects planned under intra-State System Strengthening Scheme			SR
	(i) 220kV Substation at Neeleswaram, Kasargode Dt			SR
	a. 220/110kV, 2x200MVA transformers	Trf	220kV	SR
	b. Ten 220kV and eight 110kV line bays	Bays	220kV	SR
	c. LILO of both circuits of existing 220kV Kanhirode – Mylatty 220kV D/c feeder	D/C	220kV	SR
	d. two 220kV D/c feeders along the RoW of existing 110kV lines using MCMV towers.		220kV	SR
	(ii) 220kV Substation at Thalassery, Kannur Dt			SR
	a. 220/110kV, 2x160MVA transformers	Trf	220kV	SR
	b. Eight 220kV and six 110kV line bays.	Bays	220kV	SR
	c. LILO of existing 220kV Orkattery – Kanhirode feeder.	D/C	220kV	SR
	d. construction of 220kV D/c feeders along the RoW of existing 110kV lines using MCMV towers.	D/C	220kV	SR
	(iii) 220kV Substation at Mundayad, Kannur Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x160MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. construction of 220kV D/c feeders along the RoW of existing 110/66kV lines using MCMV towers from the proposed 220kV Substation, Thalassery and existing 220kV Substation, Kanhirode.	D/C	220kV	SR
	(iv) 220kV Substation at Kakkayam by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x200MVA transformers	Trf	220kV	SR
	b. Four 220kV line bays	Bays	220kV	SR
	c. LILO of existing 220kV Areekode – Kaniampetta S/c feeder.	S/C	220kV	SR
	d. construction of 220kV D/c feeder along the RoW of existing 110kV D/c feeder using MCMV towers.	D/C	220kV	SR
	(v) 220kV Substation at Kunnamangalam, Kozhikode Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	c. LILO of existing 220kV Areekode – Kanhirode feeder.	D/C	220kV	SR
	(vi) 220kV Substation at Elamkur, Malappuram Dt			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. two 220kV and four 110kV line bays.	Bays	220kV	SR
	c. LILO of existing 220kV Madakathara – Areekode feeder.	D/C	220kV	SR
	(vii) 220kV Substation Kunnamkulam, Thrissur Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. two 220kV line bays	Bays	220kV	SR
	c. LILO of proposed 220kV Madakathara – Nallalam feeder.	D/C	220kV	SR
	(viii) 220kV Substation Edappal, Malappuram Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. LILO of proposed 220kV Madakathara – Malaparamba feeder	D/C	220kV	SR
	(ix) 220kV Substation at Panjal, Thrissur Dt			SR
	a. eight 220kV line bays	Bays	220kV	SR
	b. interlinking of 220kV Madakathara – Palakkad, Elappully – Madakathara, Shornur – Areekode and Madakathara – Areekode feeders		220kV	SR
	(x) 220kV Substation Viyyur, Thrissur Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. upgradation of existing 110kV Madakathara – Viyyur D/c feeder to 220kV D/c feede	D/C	220kV	SR
	d. 220kV Substation North Parur planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.	M/CMV	220kV	SR
	xi) 220kV Substation Chalakkudy, Thrissur Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. LILO of one circuit of existing 220kV Lower Periyar – Madakathara D/c feeder	D/C	220kV	SR
	d. 220kV Substation Aluva planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.	M/CMV	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(xii) 220kV Substation Aluva, Ernakulam Dt by upgradation of existing 110kV Substation		220kV	SR
	a. 220/110kV, 2x200MVA transformers	Trf	220kV	SR
	b. six 220kV line bays	Bays	220kV	SR
	c. upgradation of existing 66kV Kalamassery – Aluva D/c feeder to 220kV D/c feeder.	D/C	220kV	SR
	d. 220kV Substations at Kothamangalam, Pallivasal and Chalakkudy planned by upgrading existing 66kV transmission system to 220/110kV MCMV system using the existing RoW.	M/CMV	220kV	SR
	(xiii) 220kV Substation North Parur, Ernakulam Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays.	Bays	220kV	SR
	c. upgradation of existing 66kV Aluva – North Parur D/c feeder to 220kV D/c feeder	D/C	220kV	SR
	d. 220kV Substation Viyyur planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.	MCMV	220kV	SR
	(xiv) 220kV Substation Kaloor, Ernakulam Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x200MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. construction of 220kV Bhramapuram – Kaloor D/c feeder	D/C	220kV	SR
	d. 220kV Substation, Kalamassery also planned by upgrading existing 110kV transmission system to 220/110kV MCMV system	MCMV	220kV	SR
	(xv) 220kV Substation Kothamangalam, Ernakulam Dt by upgradation of existing 66kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. LILO of one circuit of 220kV Pallivasal – Aluva D/c feeder.	D/C	220kV	SR
	(xvi) 220kV Substation Pallivasal, Idukki Dt			SR
	a. 220/66kV, 2x50MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. LILO of existing 220kV Udumalpet – Idukki S/c feeder.	S/C	220kV	SR
	d. 220kV Substations at Kothamangalam, Kuyilimala and Aluva are planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.	MCMV	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	(xvii) 220kV Substation Ettumanoor, Kottayam Dt			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. LILO of existing 220kV Pallom – Ambalamughal and Sabarigiri – Ambalamughal feeders	D/C	220kV	SR
	(xviii) 220kV Substation Eramalloor, Alleppey Dt			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays.	Bays	220kV	SR
	c. construction of a 220kV D/c feeder from Brahmapuram	D/C	220kV	SR
	d. 220kV Substation Punnapra is planned by upgrading existing 110kV transmission system to 220/110kV MCMV system.	MCMV	220kV	SR
	(xix) 220kV Substation Pathanamthitta by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. LILO of existing 220kV Sabarigiri – Edamon S/c feeder.	S/C	220kV	SR
	d. 220kV Substation Edappon planned by upgrading existing 66kV transmission system to 220/110kV MCMV system.	MCMV	220kV	SR
	(xx) 220kV Substation Kakkad, Pathanamthitta Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x50MVA transformers	Trf	220kV	SR
	b. two 220kV line bays.	Bays	220kV	SR
	c. LILO of existing 220kV Sabarigiri – Pallom feeder.	DC	220kV	SR
	(xxi) 220kV Substation Parippally, Kollam Dt by upgradation of existing 110kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR
	c. upgradation of existing 110kV Kundara – Parippally D/c feeder to 220/110kV MCMV feeder.	MCMV	220kV	SR
	d. LILO of one circuit of existing 220kV Edamon – Pothencode D/c feeder along the RoW of existing 110kV network by upgrading it to 220/110kV MCMV system.	MCMV	220kV	SR
	(xxii) 220kV Substation Vizhinjam, Trivandrum Dt by upgradation of existing 66kV Substation			SR
	a. 220/110kV, 2x100MVA transformers	Trf	220kV	SR
	b. four 220kV line bays	Bays	220kV	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	c. construction of 220kV Kattakkada – Vizhinjam D/c feeder.	D/C	220kV	SR
SR - 33	**Maheshwaram(AP)**		Scheme	SR
	1- Establishment of Maheshwaram(AP) 400/220kV substation with 2x500 MVA transformers	Trf	400kV	SR
	2-Maheshwaram (PG) – Maheshwaram (AP) by bus extension or by short 400kV D/c line – by APTRANSCO	DC	400kV	SR
	3-Maheshwaram (AP) – Yeddumailaram (Shankarapalli) 400kV D/c line (to be established by re-alignment of the 'LILO of Srisailam – Mamadipalli at Shankarapalli' and re-instating the Srisailam – Mamadipalli 400kV D/c line	DC	400kV	SR
	4-LILO of Nizamabad – Yeddumailaram (Shankarpalli) 400kV D/c line at Narsapur	DC	400kV	SR
SR - 34	**Power evacuation system from 1040 MW power plant of M/s Hinduja at Vishakapatnam**		Scheme	SR
	1-400kV twin moose D/c line from Kalpaka S/s to Hinduja (HNPCL) Switchyard	DC	400kV	SR
	2-A new 400/220kV KVKota S/s with 2x315MVA capacity		400kV	SR
	3- 400kV twin moose D/c line from HNPCL switchyard to the proposed KVKota S/s	DC	400kV	SR
	4 -A new 400/220kV KVKota S/s with 2x315MVA capacity	Trf	400kV	SR
	5-400kV twin moose D/c line from HNPCL switchyard to the proposed KVKota S/s	DC	400kV	SR
	6-A new 400/220kV KVKota S/s with 2x315MVA capacity		400kV	SR
	7-400kV twin moose D/c line from HNPCL switchyard to the proposed KVKota S/s	DC	400kV	SR
	8-400kV twin moose D/c line from proposed KVKota S/s to Vemagiri S/s	DC	400kV	SR
SR - 35	**Transmission evacuation schemes of Manuguru TPP(4x270 MW), Kothagudam TPS Stage- VII (1x800MW)**		scheme	SR
	Manuguru TSGENCO plant switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose 400 kV DC line.			SR
	1x125 MVAR Bus reactor at Manuguru switchyard			SR
	KTPS Stage VII switchyard to proposed 400/220kV Bommanapalli SS with Quad Moose 400kVDC line.			SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	1x125 MVAR Bus reactor at KTPS Stage VII switchyard			SR
	From proposed 400/220kV Bommanapalli SS to upcoming Suryapet 400/220/132kV SS by Quad Moose 400kV DC line			SR
	From proposed 400/220kV Bommanapalli SS to proposed 400/220kV Jangaon SS by Quad Moose 400kV DC line			SR
	From proposed 400/220kV Jangaon SS to proposed 400kV Tippapur LI SS by Quad Moose 400kV DC line			SR
	From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Kallur SS by Single Moose 220kV DC line-			SR
	From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Pedagopathi SS by Single Moose 220kV DC line			SR
	From proposed 400/220kV Bommanapalli SS to proposed 220/132kV Bommanapalli SS by Single Moose 220kV DC line			SR
	From Proposed 400/220 kV Jangaon SS to Upcoming 220/132 kV Jangaon SS by Single Moose 220kV DC Line			SR
	From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Husnabad SS by Single Moose 220kV DC Line			SR
	From Proposed 400/220 kV Jangaon SS to Existing 220/132 kV Bhongiri SS by Single Moose 220kV DC Line			SR
	400/220 kV Bommanapalli SS with 2 x 315 MVA			SR
	400/220 kV Jangaon SS with 3 x500 MVA			SR
	220/132 kV Kallur SS with 3 x50 MVA			SR
	220/132 kV Husnabad SS with 2 x 80 MVA			SR
	LILO of both circuits of Malkaram-Vijaywada 400kV DC line at Suryapeta 400kV S/S instead of LILO of only one circuit			SR
	LILO of both circuits of 400 kV Srisailam – Mamdipally DC line at Dindi 400/220kV S/S.			SR
SR - 36	**Transmission evacuation schemes of Damercharela TPP**		Scheme	SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Proposed Damaracherla Switchyard to Proposed 400/220/132 kV Choutuppal SS by Quad Moose Dc Line			SR
	Proposed Damaracherla Switchyard to Proposed 400/220kV DindiSS by Quad Moose Dc Line			SR
	Proposed Damaracherla Switchyard to Proposed 400/220 kV Maheswaram(TSTRANSCO) SS by Quad Moose Dc Line			SR
	Proposed Damaracherla Switchyard to Proposed 400/220kV Jangaon SS (Jangaon SS is included in the Manuguru and KTPS VII Evacuation Scheme) by Quad Moose Dc Line			SR
	From Proposed 400/220/132 kV Choutuppal SS to Upcoming 220/33 kV Hayatnagar SS by Single Moose DC Line			SR
	From Proposed 400/220/132 kV Dindi SS to Upcoming 220/33 kV Thimmajipet SS by Single Moose DC Line			SR
	From Proposed 400/220/132 kV Dindi SS to proposed 220/132 kV Nagarkurnool SS by Single Moose DC Line			SR
	From Proposed 400/220/132 kV Dindi SS to Existing 220/33 kV KM Pally SS by Single Moose DC Line			SR
	400/220 kV Dindi SS with 3 x 500 MVA			SR
	400/220/132 kV Choutuppal SS with 3 x500 MVA+2 x 100 MVA			SR
	220/132 kV Nagarkurnool SS with 2x100 MVA			SR
	2X125 MVAR Bus reactor at Damercherla switchyard			SR
SR - 37	**evacuation of power from 1 x 800 MW VTS Extnplant of APGENCO at Vijayawada**		Scheme	
	400kV VTS- Sattenpalli Quad Moose DC line.			SR
	1x125MVAR Bus reactor at VTPS Extn.			SR
SR - 38	**400kV ring main around the proposed capital city of Andhra Pradesh**		Scheme	
	Elluru 400/220 kV substation, 2x315 MVA along with associated lines & LILO			SR
	Gudivada 400/220/132 kV, 2x500 MVA substation along with associated lines & LILO			SR
	Sattenpalli 400/220kV S/S along with associated lines & LILO			SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	400/220kV substation at CPeta by APTRANSCO – as a new substation close to 765/400kV CPeta (under ISTS) or as 400kV bus extension at proposed 765/400kV CPeta (ISTS) for erecting CPeta 400/220 kV, 2x500 MVA transformer along with associated lines & LILO			SR
	Inavolu 400/220 kV, 2x500 MVA substation along with associated lines & LILO			SR
SR - 39	**transmission scheme for providing power supply to M/s Sricity SEZ under VCIC scheme**		Scheme	
	Up-gradation of 220/132KV Rachagunneri SS to 400/220/132KV SS Rachagunneri with 2 x 315 MVA.			SR
	400KV QMDC LILO of (45KM) 400KV SS Chittoor – 400KV APGENCO Krishnapatnam.			SR
	Up-gradation of 132/33KV Cherivi SS to 220/132/33KV Chervi SS with 2 x 160 MVA.			SR
	Erection of 220 KV DC line (50KM) from 400KV SS Rachagunneri to 220KV SS at Chervi in Chittoor district			SR
	Erection of 220KV DC line (30KM) from 220KV SS Sulluripet to 220KV SS Chervi in Chittoor District.			SR
	Erection of 132/33KV SS at Yerpedu with 2 x 80MVA			SR
	Erection of 132KV DC line (5KM) from 400/220/132KV SS at Rachagunneri SS to proposed 132KV Yerpedu SS.			SR
SR - 40	**dedicated Transmission Scheme to meet the load demand of 200MW proposed by M/s APIIC at Menakur/Naidupet area under VCIC scheme**		Scheme	
	Up-gradation of existing 132/33 kV Menakuru SS to 220/132/33 kV Menakuru SS with 2 x 100 MVA PTRs			SR
	220 kV DC line (40 KM) from proposed 400/220/132 kV Rachagunneri SS to proposed 220/132/33 kV Menakuru SS			SR
	132 kV LILO (15 KM) of existing 132 kV Naidupet – Gudur line to proposed 220/132/33 kV Menakuru SS			SR
	Capacity Enhancements planned in 220kV transmission System			

Sl. No.	Scheme /details	Type	Voltage level	Region
	Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Kattakkada			SR
	Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Edappon			SR
	Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Kundara			SR
	Addition of 220/110kV, 1x200 MVA transformer at 220kV Substation Pallom			SR
	Addition of 220/110kV, 1x200 MVA transformer at 400kV Substation Madakathara			SR
	Replacing of existing 220/110kV, 2x160 MVA transformer with 2x200MVA at 220kV Substation Palakkad			SR
	Replacing of existing 220/110kV, 2x100 MVA transformer with 2x200MVA at 220kV Substation Shornur			SR
	Replacing of existing 220/110kV, 2x100 + 2x60 MVA transformers with 3x200MVA at 220kV Substation Nallalam			SR
	Addition of 220/110kV, 1x160 MVA transformer at 220kV Substation Areekode			SR
	Replacing of existing 220/110kV, 2x100 MVA transformer with 2x200MVA at 220kV Substation Malapparamba			SR
	400kV transmission System in Kerala			SR
	400kV Substations at Kottayam			SR
	400kV Substations at Kollam			SR
	400kV Substations at Edamon			SR
	400kV Substation at Kanhirode			SR
	400kV Substation at Ettumanoor			SR
	Projects planned under Green Corridor intra-State Scheme (220kV transmission System, Kerala)			
	220kV Substation at Kottathara, Palakkad Dt			SR
	220kV Substation at Vettathur, Palakkad Dt			SR
	220kV Substation Kuyilimala, Idukki Dt			SR
	Projects planned under intra-State System Strengthening Scheme (220kV transmission System, Kerala)			
	220kV Substation at Neeleswaram, Kasargode Dt			SR

Sl. No.	Scheme /details	Type	Voltage level	Region
	220kV Substation at Thalassery, Kannur Dt			SR
	220kV Substation at Mundayad, Kannur Dt			SR
	220kV Substation at Kakkayam			SR
	220kV Substation at Kunnamangalam, Kozhikode Dt			SR
	220kV Substation at Elamkur, Malappuram Dt			SR
	220kV Substation Kunnamkulam, Thrissur Dt			SR
	220kV Substation Edappal, Malappuram Dt			SR
	220kV Substation at Panjal, Thrissur Dt			SR
	220kV Substation Viyyur, Thrissur Dt			SR
	220kV Substation Chalakkudy, Thrissur Dt			SR
	220kV Substation Aluva, Ernakulam Dt			SR
	220kV Substation North Parur, Ernakulam Dt			SR
	220kV Substation Kaloor, Ernakulam Dt			SR
	220kV Substation Kothamangalam, Ernakulam Dt			SR
	220kV Substation Pallivasal, Idukki Dt			SR
	220kV Substation Ettumanoor, Kottayam Dt			SR
	220kV Substation Eramalloor, Alleppey Dt			SR
	220kV Substation Pathanamthitta			SR
	220kV Substation Kakkad, Pathanamthitta Dt			SR
	220kV Substation Parippally, Kollam Dt			SR
	220kV Substation Vizhinjam, Trivandrum Dt			SR
WR - 1	**ATS for BECL Generation Project**		Scheme	WR
	1. BECL - Botad 220 kV D/C line	D/C	220kV	WR
	2. BECL - Sagapara 220 kv D/C line	D/C	220kV	WR
	3. LILO of Sarvakundla - Vartej 220 kV line at BECL	S/C	220kV	WR
WR - 2	**ATS for Sikka Ext. (2X250MW)**		Scheme	WR
	Sikka - Moti Paneli 220 kV D/C line with Al 59 cond.	D/C	220kV	WR
	LILO of bot ckt. of Jamnagar - Jetpur 220 kV D/C line at Sikka	D/C	220kV	WR
WR - 3	**Pipavav CCPP(2x351 MW) GSECL**		Scheme	WR
	1. PipavavTPS- Dhokadva 220kV D/c line	D/C	220kV	WR
WR - 4	**ATS for Tiroda Adani Ph-1,Ph – II(1320MW+1320MW)**		Scheme	WR
	6. Aurangabad III-Aurangabad (PG) 765kV 2xS/C	S/C	765kV	WR
	7. Aurangabad III 765/400kV,2X1500MVA substation	trf	765kV	WR
WR - 5	**ATS for IndiaBulls Realtech Ltd (Nasik) (5x270 MW)**		Scheme	WR
	1. Sinnar – Nasik 400kV D/C	D/C	400kV	WR
WR - 6	**ATS for Parli (Replacement) U-8 (250MW)**		Scheme	WR

Sl. No.	Scheme /details	Type	Voltage level	Region
	2. LILO of 220kV Parli GCR-Beed at Parli D/C line	D/C	220kV	WR
WR - 7	**ATS for Koradi-II (1980 MW)**		Scheme	WR
	Koradi-II – Koradi–III 400 kV quad D/C line	D/C	400kV	WR
	2x500MVA, 400/220 kV S/s at Koradi-II	trf	400kV	WR
WR - 8	**Transmission system for Solar projects in Charanka Solar Park (950.5 MW)**		Scheme	WR
	1. (a) Charanka –Sankhari 400kV D/C line (ACSR Twin Moose)	D/C	400kV	WR
	1. (b) Charanaka 400/220 kV S/s (2x315 MVA)	trf	400kV	WR
	1. (c) 400 kV, 125 MVAR bus reactor at Charanka S/s	reactor	400kV	WR
	2. 220/66 kV ,8X100 MVA Charanka Pooling Station	trf	220kV	WR
	Transmission system for wind projects in Gujarat (4500 MW)			WR
	1. Jamanwada W/F S/S-Versana 220 kV D/C –(AAAC Moose conductor)	D/C	220kV	WR
	2. Nakhatarana W/F S/S-Versana 220 kV D/C (AAAC Moose conductor)	D/C	220kV	WR
	3. Vandiya W/F SS – Halvad (400 kV SS) 220 kV D/C line (Zebra conductor	D/C	220kV	WR
	4. Kanmer W/F SS – Halvad (400 kV SS) 220 kV D/C line (Zebra conductor)	D/C	220kV	WR
	5. Chotila W/F SS – Jasdan 220 kV D/C line (Zebra conductor	D/C	220kV	WR
	6. Malvan W/F SS – Chorania 220 kV D/C line (Zebra conductor)	D/C	220kV	WR
	7. Dhanki W/F SS – Bhatia 220 kV D/C line (Zebra conductor)	D/C	220kV	WR
	8. Bhanvad W/F SS- Bhomiyavadar 132 kV D/C line.	D/C	132kV	WR
	9. Tebhada W/F SS Nyara (Rajkot) 220 kV D/C line (AAAC Moose conductor)	D/C	220kV	WR
	10. Maliya W/F SS – Tankara 220 kV D/C line (Zebra conductor)	D/C	220kV	WR
	11. Rojmal W/F SS – Amreli 220 kV D/C line (AAAC Moose conductor)	D/C	220kV	WR
	12. Shapur W/F SS – Halvad (400 kV SS) 220 kV D/C line (AAAC Moose conductor)	D/C	220kV	WR
	13. Kodadha W/F SS – Tharad 220 kV D/C line (AAAC Moose conductor)	D/C	220kV	WR
	14. Patan W/F SS – Radhanpur 220 kV D/C line (Zebra conductor)	D/C	220kV	WR
WR - 9	**System Strengthening for wind projects in Gujarat (4500 MW)**		Scheme	WR

Sl. No.	Scheme /details	Type	Voltage level	Region
	1. Varsana-Halvad 400kV D/C Quad line along with 400/220kV, 2x315MVA Halvad substation.	D/C	400kV	WR
	3. 220/132 kV, 200MVA Bhatia substation	trf	220kV	WR
	4. 220/66 kV, 100MVA Jasdan substation.	trf	220kV	WR
	5. 220/132kV, 100MVA Jasdan substation.	trf	220kV	WR
	6. Bhatia-Kalvad-Kangasiyali 220kV D/C line (AAAC Moose).	D/C	220kV	WR
	7. Morbi-Tankara-Chorania 220kV D/C line (AAAC Moose).	D/C	220kV	WR
	8. Varsana- Bhachau- Radhanpur 220kV D/C line (AAAC Moose).	D/C	220kV	WR
	9. Nakhatrana-Varsana 220kV D/C line (ACSR Zebra).	D/C	220kV	WR
	10. Bhatia(220kV)-Bhatia(132kV) 132 kV D/C line(ACSR Panther).	D/C	132kV	WR
WR - 10	**ATS for Dhuvarn (Ext.(360MW)**		Scheme	WR
	1. LILO of Kasor-Vartej 220 kV S/c line at Dhuvarn	D/C	220kV	WR
	2. LILO of Karamsad-Vartej 220 kV S/c line at Dhuvarn	D/C	220kV	WR
WR - 11	**Conectivity of Rewa Ultra Mega Solar Ltd Park**		Scheme	WR
	(a) RUMS Ltd. switchyard – Rewa Pooling Station 220kV 3xD/c line along with associated bays at Solar Park	3 X D/C	220kV	WR
WR - 12	**Transmission System Strengthening in Madhya Pradesh under JICA**		Scheme	WR
	LILO of one circuit of 400kV Khandwa - Rajgarh PGCIL D/C line at Chhegaon 400 kV Substation	D/C	400kV	WR
	400/220kV Additional Transformer at Bina 400kV S/S	Trf	400kV	WR
	400kV Bus Reactor at Chhegaon 400kV S/S	reactor	400kV	WR
	2 no. of 400 kV bays at 400/220 kV Chhegaon S/s	bays	400kV	WR
	Pithampur400-Super Corridor 220kV DCDS line (With Low Loss ACSR Conductor)	D/C	220kV	WR
	2 no. of 220 kV bays at Pithampur400 kV S/s	bays	220kV	WR
	Establishment of Super Corridor (Indore) 220/132kV GIS S/s with2 no. of 220 kV bays	bays	220kV	WR
WR - 13	**upgradation of Udaipura S/s from 132 kV to 220 kV S/s**	S/s	Scheme	WR
	2 no. of 220 kV bays at 220 kV Udaipura S/s	bays	220kV	WR
	Charging/Upgradation of Chichli220 - Udaipura DCDS line on 220kV level	S/s	220kV	WR
	2 no. of 220 kv bays at Chichli220 kV S/s	bays	220kV	WR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Chhatarpur-Tikamgarh 220kV DCSS line (With Low Loss ACSR Conductor)	S/C	220kV	WR
	1 no. of 220 kV bay at Chhataarpur	bays	220kV	WR
	1 no. of 220 kV bay at Tikamgarh	bays	220kV	WR
	LILO of Bina220 - Ganjbasoda 220kV line at Bina(MPPTCL) 400kV S/s	D/C	220kV	WR
	2 no. of 220 kV bays at Bina (MP) 400 kV S.s	bays	220kV	WR
	Rewa220 - Rewa UMSP - Sidhi 220kV DCDS line	D/C	220kV	WR
	Rewa220 - Rewa UMSP 220kV DCDS line with Low Loss ACSR Conductor (30km)			WR
	Rewa UMSP - Sidhi 220kV DCDS line (60km)			WR
	2 no. of 220 kV bays at 220 kV at Rewa 220 kV S/s	bays	220kV	WR
	2 no. of 220 kV bays at 220 kV at Sidhi 220 kV S/s	bays	220kV	WR
	4 no. of 220 kV bays at 220kV Rewa UMSP S/s	bays	220kV	WR
WR - 14	**Transmission System Strengthening in Madhya Pradesh under GEC - I**		Scheme	WR
	System Strengthening Required for projects in Badwani District			WR
	220kV D/C line from Julwaniya 400kV S/s to Sendhwa 220kV S/s	D/C	220kV	WR
	220/132/33kV S/s at Sendhwa	S/s	220kV	WR
	220/132/33kV S/s at Sendhwa	S/s	132kV	WR
	2 Nos 220kV Feeder bays at Julwaniya 400kV S/s	bays	220kV	WR
	System Strengthening Required for projects in Betul District			WR
	220kV D/C line from Betul 220kV S/s to Gudgaon 220kV S/s	D/C	220kV	WR
	220/132/33kV S/s at Gudgaon	S/s	220kV	WR
	220/132/33kV S/s at Gudgaon	S/s	132kV	WR
	2 Nos 220kV Feeder bays at Betul 220kV S/s	bays	220kV	WR
	System Strengthening Required for projects in Dhar District			WR
	220kV D/C line from Badnawar 400kV S/s to Kanwan 220kV S/s	D/C	220kV	WR
	220/132/33kV S/s at Kanwan	S/s	220kV	WR
	220/132/33kV S/s at Kanwan	S/s	132kV	WR
	220kV D/C line from Kanwan 220kV S/s to Dhar 220kV S/s	D/c	220kV	WR
	2 Nos 220kV Feeder bays at Badnawar 400kV S/s	bays	220kV	WR
	2 Nos 220kV Feeder bays at Dhar 220kV S/s	bays	220kV	WR

Sl. No.	Scheme /details	Type	Voltage level	Region
	System Strengthening Required for projects in Mandsaur District			WR
	400kV D/C line from Nagda 400kV S/s to Mandsaur 400kV S/s	D/C	400kV	WR
	400/220/132kV S/s at Mandsaur	S/s	400kV	WR
	400/220/132kV S/s at Mandsaur	S/s	220kV	WR
	1x125MVAR, 400kV Bus Reactor at 400kV S/s Mandsaur	reactor	400kV	WR
	LILO both circuits of Nagda - Neemuch 220kV line at Mandsaur 400kV S/s	D/C	220kV	WR
	LILO both circuits of Badod-Kota-Modak 220kV line at Suwasara 220kV S/s	D/c	220kV	WR
	220/132/33kV S/s at Suwasara	s/s	220kV	WR
	220/132/33kV S/s at Suwasara	s/s	220kV	WR
	220kV D/C line from Mandsaur 400kV S/s to Marut Shakti Pool 220kV S/s	D/c	220kV	WR
	2 Nos 400kV Feeder bays at Nagda 400kV S/s	bays	400kV	WR
	2 Nos 220kV Feeder bays at Marut Shakti Pool 220kV S/s	bays	220kV	WR
	System Strengthening Required for projects in Neemuch District			WR
	220kV D/C line from Neemuch 220kV S/s to Ratangarh 400kV S/s	D/c	220kV	WR
	220/132/33kV S/s at Ratangarh 400kV S/s	s/s	220kV	WR
	220/132/33kV S/s at Ratangarh 400kV S/s	s/s	220kV	WR
	2 Nos 220kV Feeder bays at Neemuch 220kV S/s	bays	220kV	WR
	System Strengthening Required for projects in Ratlam District			WR
	220kV Interconnector between Sailana 400kV S/s and Ratlam Switching 220kV S/s	S/c	220kV	WR
	220kV/132/33kV S/s at Sailana 400kV S/s	s/s	220kV	WR
	220kV/132/33kV S/s at Sailana 400kV S/s	s/s	220kV	WR
	2nd Circuiting of Ratlam Switching - Daloda 220kV line	S/c	220kV	WR
	LILO of Ratlam-Daloda 220kV line at Jaora 220kV S/s	D/C	220kV	WR
	220/132kV S/s at Jaora (Upgradation)	S/s	220kV	WR
	1 Nos 220kV Feeder bays at Ratlam Switching 220kV S/s	bays	220kV	WR
	2 Nos 220kV Feeder bays at Ratlam Switching 220kV S/s	bays	220kV	WR
	1 Nos 220kV Feeder bays at Daloda 220kV S/s	bays	220kV	WR
	System Strengthening Required for projects in Rewa District			WR
	LILO of one circuit of Satna(PGCIL) - Bina(PGCIL) 400kV line at Sagar 400kV S/s	d/c	400kV	WR
	400/220kV S/s at Sagar (Upgradation)	S/s	400kV	WR

Sl. No.	Scheme /details	Type	Voltage level	Region
	1x125MVAR, 400kV Bus Reactor at 400kV S/s Sagar	reactor	400kV	WR
	System Strengthening Required for projects in Shajapur District			WR
	400kV D/C line from Ashta 400kV S/s to Ujjian 400kV S/s	D/c	400kV	WR
	400/220/132kV S/s at Ujjain	S/s	400kV	WR
	400/220/132kV S/s at Ujjain	S/s	400kV	WR
	1x125MVAR, 400kV Bus Reactor at 400kV S/s Ujjain	reactor	400kV	WR
	400kV D/C line from Nagda 400kV S/s to Ujjian 400kV S/s	D/C	220kV	WR
	400kV D/C line from Indore(PGCIL) 765kV S/s to Ujjian 400kV S/s	D/C	400kV	WR
	220kV D/C line from Rajgarh(B) 220kV S/s to Susner 220kV S/s	D/C	220kV	WR
	LILO both circuits of Ujjain - Badod 220kV and Ujjain-Nagda 220K line at Ujjain 400kV S/s	D/C	220kV	WR
	220kV D/C line from Badod 220kV S/s to Susner 220kV S/s	D/C	220kV	WR
	220kV D/C line from Ujjain 400kV S/s to Susner 220kV S/s	D/C	220kV	WR
	220/132/33kV S/s at Susner	s/s	220kV	WR
	220/132/33kV S/s at Susner	s/s	220kV	WR
	2 Nos 400kV Feeder bays at Ashta 400kV S/s	bays	400kV	WR
	2 Nos 400kV Feeder bays at Nagda 400kV S/s	bays	400kV	WR
	2 Nos 400kV Feeder bays at Indore(PGCIL) 400kV S/s	bays	400kV	WR
	2 Nos 220kV Feeder bays at Rajgarh(B)	bays	220kV	WR
	4 Nos 220kV Feeder bays at Badod,Ujjain400	bays	220kV	WR
	Transmission System Strengthening in Maharashtra under GEC			WR
	2nd ckt strining of 220kv Miraj - Ichalkaranji SCDC line	S/C	220kV	WR
	1X25MVAR Bus reactors at 220kv Dhule S/s	reactor	220kV	WR
	2nd ckt. stringing of 220 kV Valve - Jamde SCDC line has been proposed	S/C	220kV	WR
	220kv D/C line from M/s Vish Wind S/s - Bhenda	D/C	220kV	WR
	LILO of one ckt of 220kV Beed - Patoda D/C line has been proposed	D/C	220kV	WR
	Transmission System Strengthening in States			WR
	Establishment of 400/220 kV Kudus S/s	S/s	400kV	WR

Sl. No.	Scheme /details	Type	Voltage level	Region
	Installation of 400/220 kV 315 MVA ICT at Bhopal S/s	trf	400kV	WR
	Pune - Higewadi 220 kV D/C line	D/c	220kV	WR
	LILO of Chitegaon - Shendra 220 kV D/C at Auranagabad 765/400/220 kV s/s	D/c	220kV	WR
WR - 15	**Establishment of Badnawar 400/220KV S/s and Kirnapur 400/132kV S/s-**		Scheme	WR
	Establishment of 2X315 MVA, 400/220KV Badnawar substation	trf	400/220kV	WR
	LILO of both circuits of 400kV Nagda – Rajgarh D/C line at Badnawar	D/C	400kV	WR
	2X100 MVA, 400/132kV Kirnapur (Distt-Balaghat substation)	trf	400/132kV	WR
	LILO of 400kV S/c line between Bhilai and Seoni at Kirnapur	S/c	400kV	WR

Annex – 7.4

Intra State Transmission System submitted by States

REG.	Sl. No	State	Scheme /details	Voltage (kV)	Type	Present Status
ER	**OD-01**	**ODISHA**	**ODISHA 765 KV SYSTEM ADDITION**			
			1. Begunia Substation (2x 1500) MVA	765/400	trf	Proposed in 13th plan
ER	**OD-02**	**ODISHA**	**ODISHA 400 KV SYSTEM ADDITION**			
			1. Lapanga Substation (2x 315) MVA	400/220	trf	Approved by OPTCL Board
			2. Meramundali B Substation (2x 500) MVA	400/220	trf	Approved by CEA
			3. Khuntuni Substation (2x 500) MVA	400/220	trf	Approved by CEA
			4. Narendrapur Substation (2x500) MVA	400/220	trf	Approved by CEA
			5. Bhadrak Substation (2x500) MVA	400/220	trf	In-principle approved by CEA

			6. Paradeep Substation (2x500) MVA	400/220	trf	In-principle approved by CEA
			8. Duburi Sunstation (1x 315) MVA	400/220	trf	Approved by CMD
ER	**OD-03**	**ODISHA**	**ODISHA 765 KV TRANSMISSION LINES ADDITION**			
			1. 765kV D/C line from OTPCL generation to Begunia.	765	D/C	Proposed in 13th plan
			2. 765kV D/C line from Angul PG to Begunia.	765	D/C	Proposed in 13th plan
ER	**OD-04**	**ODISHA**	**ODISHA 400 KV TRANSMISSION LINES ADDITION**			
			LILO of 400kV D/C line from Khuntuni to Mendhasal at Begunia	400	D/C	Proposed in 13th plan
			LILO of 400kV D/C line from Pandiabil to Narendrapur at Begunia	400	D/C	Proposed in 13th plan
			LILO of both circuits of Sterlite to Meramundli 400kV D/C line at Lapanga.	400	D/C	Proposed in 13th plan
			LILO of 400kV D/C line from Meramundali to Duburi at Khuntuni.	400	D/C	Proposed in 13th plan
			LILO of 400kV D/C line from Meramundali to Mendhasal at Khuntuni.	400	D/C	Proposed in 13th plan
			400kV D/C line from Pandiabil 400/220kV substation to Narendrapur 400/220kV substation.	400	D/C	Proposed in 13th plan
			400kV D/C line from Duburi 400/220kV substation to Bhadrak 400/220kV substation.	400	D/C	Proposed in 13th plan
ER	**WB-01**	**WEST BENGAL**	**WEST BENGAL 400 KV SYSTEM ADDITION**			
			New PPSP 400 kV GIS	400	trf	Approved
			New Katwa 400/220 kV GIS (2x500) MVA	400/220	trf	Approved
			New Haldia NIZ 400/220 kV GIS (2x315) MVA	400/220	trf	Approved
			New Chanditala (1x315) MVA	400/220	trf	Approved
			Durgapur (1x315) MVA	400/220	trf	Planned
			Gokarna (1x315) MVA	400/220	trf	Planned
			New Chanditala (1x315) MVA	400/220	trf	Planned
			New Katwa (1x315) MVA	400/220	trf	Planned

ER	**WB-02**	**WEST BENGAL**	**WEST BENGAL 400 KV TRANSMISSION LINES ADDITION**			
			LILO of Arambag-PPSP 400KV D/C at New PPSP	400	D/C	Approved
			LILO of Arambag-Durgapur 400KV S/C at New Chanditala	400	S/C	Approved
			Katwa TPS - New Katwa 400 kV D/C	400	D/C	Planned
			D/C LILO of Gokarna - N. Chanditala 400 kV D/C at New Katwa	400	D/C	Planned
			400 kV D/C line from New Katwa to common tower of Jeerat - BKTPP	400	D/C	Planned
			LILO of KTPP - Kharagpur 400 kV S/C at N.Haldia NIZ	400	S/C	Planned
ER	**BR-01**	**BIHAR**	**BIHAR 400 KV SYSTEM ADDITION**			
			GIS substation at Naubatpur, BGCL (2x500+2x160+2x80) MVA	400/220 /132/33	trf	Proposed under 12th plan. DPR under approval
			GIS substation at Bakhtiyarpur, BGCL (2x500+2x160) MVA	400/220 /132	trf	Proposed under 12th plan. DPR under approval
			GIS Substation at Jakkanpur, BGCL (2x500+3x160+4x80) MVA	400/220 /132/33	trf	Proposed under 12th plan. DPR under approval
			Sitamarhi (2x500+2x200) MVA	400/220 /132	trf	Proposed under 13th plan
			Chandauti (3x500+3x200) MVA	400/220 132	trf	Proposed under 13th plan
			Saharsa (2x500+2x200) MVA	400/220 /132	trf	Proposed under 13th plan
			Biharshariff (1x500) MVA	400/220	trf	Proposed under 13th plan
			Banka(PG) (1x315) MVA	400/132	trf	Proposed under 13th plan
			Lakhisarai(PG) (1x315) MVA	400/132	trf	Proposed under 13th plan
			Motihari(New) (1x315) MVA	400/132	trf	Proposed under 13th plan

ER	**BR-02**	**BIHAR**	**BIHAR 400 KV TRANSMISSION LINES ADDITION**			
			LILO of 400 kV D/C (Quad) Barh-Patna line at Bakhtiyarpur (New)	400	D/C	Proposed under 12th plan. DPR under approval
			LILO of 400 kV D/C Nabinagar-II-Patna(PG) Transmission Line at Jakkanpur (New)	400	D/C	Proposed under 12th plan. DPR under approval
			LILO of 400 kV D/C (Quad), ckt 3&4, of Patna-Balia line, at Naubatpur (New)	400	D/C	Proposed under 12th plan. DPR under approval
			400 KV Darbhanga- Sitamarhi (New) D/C	400	D/C	Proposed under 13th plan
			LILO of Nabinagar-II-Gaya 400 kV D/C (Quad) at Chandauti (new)	400	D/C	Proposed under 13th plan
			LILO of Kishanganj-Patna 400kV D/C (Quad) at Saharsa (New)	400	D/C	Proposed under 13th plan
			400 KV Sitarmahi (New)-Motihari D/C	400	D/C	Proposed under 13th plan
ER	**JH-01**	**JHARKHAND**	**JHARKHAND 400 KV SYSTEM ADDITION**			
			Patratu (2x315) MVA	400/220	trf	Approved
			Latehar (2x315+2x150) MVA	400	trf	
	JH-02	**JHARKHAND**	**JHARKHAND 400 KV TRANSMISSION LINES ADDITION**			
			400 KV D/C Latehar(JSEB) TO 400 KV PTPS G/S/S	400	D/C	
			400 KV D/C ESSAR (Latehar)-JSEB 400 KV G/S/S (Latehar) TL by Quad Moose conductor	400	D/C	
ER	**SK-01**	**SIKKIM**	**SIKKIM 400 KV SYSTEM ADDITION**			
			0	0	0	
ER	**SK-02**	**SIKKIM**	**SIKKIM 400 KV TRANSMISSION LINES ADDITION**			
			0	0	0	

ER	**AN-01**	**ANDAMAN AND NICOBAR ISLANDS**	**DATA NOT SUBMITTED**			
NER	**AS-01**	**ASSAM**	**ASSAM 400 KV SYSTEM ADDITION**			
			Rangia (2x500) MVA	400/220	trf	Approved
			Sonapur (2x315) MVA	400/220	trf	Approved
NER	**AS-02**	**ASSAM**	**ASSAM 400 KV TRANSMISSION LINES ADDITION**			
			LILO of Silchar - Byrnihat 400 kV S/C line at Sonapur	400	S/C	Approved by CEA
NER	**MN-01**	**MANIPUR**	**MANIPUR 400 KV SYSTEM ADDITION**			
			Thoubal (1x315) MVA	400/132	trf	Approved
NER	**MN-02**	**MANIPUR**	**MANIPUR 400 KV TRANSMISSION LINES ADDITION**			
			Yurembam (PGCI) to Thoubal via Nambol	400	D/C	Approved
NER	**ML-01**	**MEGHALAYA**	**MEGHALAYA 400 KV SYSTEM ADDITION**			
			0	0	0	
NER	**ML-02**	**MEGHALAYA**	**MEGHALAYA 400 KV TRANSMISSION LINES ADDITION**			
			0	0	0	
NER	**NL-01**	**NAGALAND**	**NAGALAND 400 KV SYSTEM ADDITION**			
			0	0	0	
NER	**NL-02**	**NAGALAND**	**NAGALAND 400 KV TRANSMISSION LINES ADDITION**			
			0	0	0	
NER	**TR-01**	**TRIPURA**	**TRIPURA 400 KV SYSTEM ADDITION**			
			0	0	0	
NER	**TR-02**	**TRIPURA**	**TRIPURA 400 KV TRANSMISSION LINES ADDITION**			

			0	0	0	
NER	**MZ-01**	**MIZORAM**	**MIZORAM 400 KV SYSTEM ADDITION**			
			0	0	0	
NER	**MZ-02**	**MIZORAM**	**MIZORAM 400 KV TRANSMISSION LINES ADDITION**			
			0	0	0	
NER	**AR-01**	**ARUNACHAL PRADESH**	**DATA NOT SUBMITTED**			
SR	**AP-01**	**ANDHRA PRADESH**	**ANDHRA PRADESH 400 KV SYSTEM ADDITION**			
			KALIKIRI (2x315) MVA	400/220	trf	Works to be commenced.
			PODILI (3x315) MVA	400/220	trf	Works to be commenced.
			HINDUPUR (3x315) MVA	400/220	trf	Works to be commenced.
			RACHAGUNNERI (2x315) MVA	400/220	trf	---
			GUDIWADA (1200 MVA)	400/220	trf	---
			INAVOLU/THULLUR (2x315) MVA	400/220	trf	---
			ELURU (2x315) MVA	400/220	trf	---
			CHILAKALURIPETA (2x500) MVA	400/220	trf	---
			ASPIRI (1145 MVA)	400/220	trf	---
			URAVAKONDA 2 (4x315) MVA	400/220	trf	
			TALARICHERUVU (3x315) MVA	400/220	trf	
			MYALAVARAM (3x315) MVA	400/220	trf	
			KORUPROLU (3x315) MVA	400/220	trf	---
			NELLORE POOLING STATION (AP) (4x315) MVA	400/220	trf	
			NIDADAVOLU 400KV SS (2x315) MVA	400/220	trf	
			TEKKALI 400KV SS (2x315) MVA	400/220	trf	
SR	**AP-02**	**ANDHRA PRADESH**	**ANDHRA PRADESH 400 KV TRANSMISSION LINES ADDITION**			
			PANYAM (SOL GEN AT GANI)400KV SS TO JAMMALMADUGU 400KV SS	400	D/C	Phase - II works. Tenders to be called for

			LILO TO PROPOSED KALIKIRI 400KV SS FROM MUDDANUR-CHITTOR CKT 1	400	D/C	Works to be commenced.
			LILO TO PROPOSED KALIKIRI 400 KV SS FROM MUDDANUR-CHITTOOR CKT 2	400	D/C	Works to be commenced.
			VEMAGIRI TO PROPOSED KAMAVARAPUKOTA 400KV SS	400	D/C	Works under progress. Expected completion - 25.05.2017
			VTPS STG V TO SATTENAPALLI 400KV SS	400	D/C	---
			PROPOSED HINDUPUR TO PROPOSED URAVAKONDA	400	D/C	Works under progress. Expected completion - 20.10.2017
			LILO OF KRISHNAPATNAM (APGENCO) TO CHITTOR LINE (CKT1) TO PROPOSED RACHAGUNNERI 400KV SS	400	D/C	---
			LILO OF KRISHNAPATNAM (APGENCO) TO CHITTORE LINE (CKT2) TO PROPOSED RACHAGUNNERI 400KV SS	400	S/C	---
			LILO OF VTS Stg V - SATTENAPALLI CKT1 TO PROPOSED INAVOLU/THULLUR 400KV SS	400	D/C	---
			LILO OF VTS Stg V - SATTENAPALLI CKT2 TO PROPOSED INAVOLU/THULLUR 400KV SS	400	D/C	
			LILO OF VEMAGIRI - SATTENAPALLI CKT1 TO PROPOSED ELURU 400KV SS	400	D/C	---
			LILO OF VEMAGIRI - SATTENAPALLI CKT2 TO PROPOSED ELURU 400KV SS	400	D/C	---
			ELURU 400KV SS TO PROPOSED GUDIWADA 400KV SS	400	D/C	---
			GUDIVADA 400 KV SS TO PROPOSED CHILAKALURIPETA 400 KV SS	400	D/C	---
			CHILAKALURIPETA 765/400 KV SS TO CHILAKALURIPETA 400 KV SS	400	D/C	---
			LILO of 400kV DC line from Uravakonda 400kv SS to Jammalamadugu line (CKT 1) to proposed Talaricherla 400kV SS	400	D/C	
			LILO of 400kV DC line from Uravakonda 400kv SS to Jammalamadugu line (CKT 2) to proposed Talaricherla 400kV SS	400	D/C	

			400kVQuad moose DC line Jammalamadugu to proposed 400kV Mylavaram SS	400	D/C	
			400kVQuad Moose DC line from Aspiri to Kurnool SS	400	D/C	
			400kV Quad Moose DC line from 400kV Uravakonda SS to proposed 400kv Uravakonda 2 SS	400	D/C	
			PROPOSED PUDIMADAKA 765/400KV TO PROPOSED KORUPROLU (PUDIMADAKA) 400KV SS	400	D/C	
			POLAVARAM HEP TO PROPOSED NIDADAVOLU 400KV SS	400	D/C	
			POLAVARAM HEP TO KVKOTA 400KVSS	400	D/C	
			NELLORE POOLING STATION PGCIL TO PROPOSED NELLORE POOLING STATION AP	400	D/C	
			POLAKI 765/400KV SS TO TEKKALI 400/220KV SS	400	D/C	
			POLAKI 765/400KV SS TO GARIVIDI 400/220KV SS	400	D/C	
			PALASA 765/400KV SS(PGCIL) TO TEKKALI 400/220KV SS	400	D/C	
			KALAPAKA 400KV SS TO KORUPROLU 400KVSS	400	D/C	
			ITCHAPURAM COAL PLANT GEN 400KV TO PROPOSED TEKKALI 400KV SS	400	D/C	
SR	**KL-01**	**KERELA**	**KERELA 400 KV SYSTEM ADDITION**			
			400kV Substation(switching) at Edamon (2x315) MVA	400	trf	
			400kV Substation Kottayam (near to Kulathurmuzhi) (2x315) MVA	400	trf	
			Construction of 400kV Sub station at Kundara (GIS at SRS Kundara) (2x315) MVA	400	trf	
			400kV Switching Station Wayanad (Kattikulam)	400	trf	
			400kV Substation Mylatty (Kasargode) (2x500) MVA	400	trf	
SR	**KL-02**	**KERELA**	**KERELA 400 KV TRANSMISSION LINES ADDITION**			

			LILO of 400kV Thirunelveli-Edamon, Thirunelveli-Cochin East , Tirunelveli - tvm feeders to 400kV S/s Edamon	400	S/C	
			LILO of 400kV Thirunelveli-Cochin East to 400kV S/s Kottayam	400	S/C	
			400/220kV MCMV line from 400kV Substation Madakathara to 400kV Substation Areekode (Kozhikode) along the RoW of existing 220kV Madakathara – Malaparamba – Areekode S/c. 220kV D/c in the 400/220kV MCMV line from Madakathara terminated at 220kV Substation Nallalam. One circuit of 220kV D/c LILO-ed at 220kV Substation Malaparamba.	400	DC/SC	NIT Aug 16-Award Oct 16
			400kV/110kV MCMV line from 400kV Substation Edamon to 400kV Substation kundara (Kollam) along the RoW of existing 110kV Edamon – Ambalappuram S/c feeder	400	DC/SC	
			LILO of 400kV Mysore – Areekode (Kozhikode) D/c line to 400kV Switching Station Wayanad (Kattikulam)	400	D/C	
			400kV Wayanad (Kattikulam) – Kasargode (Mylatty) D/c line	400	D/C	
SR	**TS-01**	**TELANGANA**	**TELANGANA 400 KV SYSTEM ADDITION**			
			JULURUPADU (2x315) MVA	400	trf	Contract awarded and work under progress
			NIRMAL (3x315) MVA	400	trf	Contract awarded and work under progress
			MAHESHWARAM (2x500) MVA	400	trf	Contract awarded and work under progress
			MANIKONDA (2x315) MVA	400	trf	Under tendering process
			MYDARAM (1120 MVA)	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
			RAMADUGU LI (1120 MVA)	400	trf	
			TIPPAPUR LI (480 MVA)	400	trf	
			CHANDULAPUR(1x500) MVA	400	trf	
			TUKKAPUR LI (200 MVA)	400	trf	
			YELLAMPALLI (3x500) MVA	400	trf	

			JANGAON(3x500) MVA	400	trf	Under tendering process
			CHOUTUPPAL(3x500) MVA	400	trf	Tenders to be called for
			NARLAPUR LI (1440 MVA)	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
			YEDULA LI (1620 MVA)	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
			VATTEM/KARVENA LI (1440 MVA)	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
			UDDANDAPUR LI (900 MVA)	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
			RAMACHANDRAPURAM (2x500) MVA	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
			DAMACHERLA (3x500) MVA	400	trf	scheme is under system studies
			NEDUNURU (1200 MVA)	400	trf	CEA gave In-Principle approval vide MOM dated 14.06.2016
SR	**TS-02**	**TELANGANA**	**TELANGANA 400 KV TRANSMISSION LINES ADDITION**			
			LILO OF 2ND CKT OF VTS - MALKARAM TO SURYAPET	400	S/C	-
			LILO OF Ckt-II OF SURYPET - SHANKARPALLY TO MANIKONDA SS	400	S/C	-
			RAMADUGU SS TO MEDARAM SS	400	S/C	-
			RAMADUGU SS TO TIPPAPUR SS	400	S/C	-
			LILO OF BOTH CIRCUITS OF JAIPURAM - GAJWEL LINE TO RAMADUGU SS	400	S/C	-
			LILO OF KTPP - GAJWEL LINE TO CHANDLAPUR SS	400	S/C	-
			TIPPAPUR SS TO CHANDLAPUR SS	400	S/C	-

			CHANDLAPUR SS TO TUKKAPUR SS	400	S/C	-
			NARSAPUR SS TO TUKKAPUR SS	400	S/C	-
			LILO OF BOTH CKTS OF RAMADUGU SS- STTP JAIPUR LINE TO YELLAMPALLI SS	400	S/C	-
			LILO OF BOTH CKTS OF NEDUNURU - TELANGANA STPP LINE TO YELLAMPALLI SS	400	S/C	-
			JULURUPADU TO JANGAON	400	S/C	
			JANGOAN TO TIPPAPUR LI	400	S/C	
			NARLAPUR SS TO YEDULA SS	400	S/C	
			VELTOOR SS TO YEDULA	400	S/C	
			YEDULA SS TO MAHESWARAM SS	400	S/C	
			YEDULA SS TO VATTEM SS	400	S/C	
			LILO OF SURYAPET - MANIKONDA LINE TO UDDANDAPUR SS	400	S/C	
			VATTEM SS TO UDDANDAPUR SS	400	S/C	
			DAMARACHERLA TPP TO JANGAON	400	S/C	
			DAMARACHERLA TPP TO MAHESHWARAM(TS)	400	S/C	
			DAMACHERLA TPP TO CHOUTUPPAL	400	S/C	
			DAMACHERLA TPP TO DINDI	400	S/C	
			LILO OF TALLAPLLI(NAGARJUNASAGAR) - KURNOOL LINE AT DINDI	400	S/C	-
			JULURUPADU SS TO KHAMMAM PGCIL	400	S/C	-
			NTPC PROPOSED 2X800 MW AT RAMAGUNDAM TO NEDUNURU	400	S/C	
			LILO OF Ist CKT OF THIPPAPUR - JANGAON LINE TO NEDUNURU SS	400	S/C	
			NARSAPUR SS TO RAMACHANDRAPURAM SS	400	S/C	
			NTPC PROPOSED 2X800 MW AT RAMAGUNDAM TO NARSAPUR 400kV SS	400	S/C	
SR	**PY-01**	**PUDUCHERRY**	**PUDUCHERRY 400 KV SYSTEM ADDITION**			
			0	0		
SR	**PY-02**	**PUDUCHERRY**	**PUDUCHERRY 400 KV TRANSMISSION LINES ADDITION**			
			0	0		

SR	**TN-01**	**TAMIL NADU**	**TAMIL NADU 765 KV SYSTEM ADDITION**			
			Ariyalur (2x1500) MVA	765/400	trf	Specification put up to Board for approval and to float tender.
			North Chennai Pooling Station (GIS) (3x1500) MVA	765/400	trf	Spec under preparation
			Coimbatore (2x1500) MVA	765/400	trf	Administrative approval is under process
			Virudhunagar (2x1500) MVA	765/400	trf	Administrative approval is under process
SR	**TN-02**	**TAMIL NADU**	**TAMIL NADU 400 KV SYSTEM ADDITION**			
			Pulianthope (GIS)(3x315) MVA	400/230	trf	Price negotiation under process.
			Thennampatty(2x315 + 2x200) MVA	400/230 -110	trf	Work under progress.
			Edayarpalayam(2x315 + 3x200) MVA	400/230 -110	trf	Revised administration approval under process.
			Vellalaviduthi(2x315 + 2x200) MVA	400/230 -110	trf	Estimate under scrutiny.
			Guindy (GIS)(2x315) MVA	400/230	trf	Tender under process
			Mylapore/Taramani(1030 MVA)	400/230 -110	trf	Sanction awaited
			Korattur (GIS)(2x315 + 2x200) MVA	400/230 -110	trf	Tender to be floated.
			Samugarengapuram(2x315 + 2x200) MVA	400/230	trf	
			Ottapidaram(2x315) MVA	400/230	trf	
			Selvapuram(2x315 + 2x200) MVA	400/230	trf	
			Thuraiyur(2x315 + 2x200) MVA	400/230	trf	
			Kolappalur(2x315 + 2x200) MVA	400/230	trf	
			Mangalapuram(2x315 + 2x200) MVA	400/230	trf	
SR	**TN-03**	**TAMIL NADU**	**TAMIL NADU 765 KV TRANSMISSION LINES ADDITION**			
			Erection of 765 kV DC line with Hexa Zebra conductor from North Chennai Pooling station to Ariyalur 765 kV SS.	765	D/C	Estimate is under preparation

			Erection of 765 kV DC line on DC towers with Hexa Zebra conductor from Ariyalur to Thiruvalam PGCIL 765/400 kV SS.	765	D/C	Tender under process
SR	**TN-04**	**TAMIL NADU**	**TAMIL NADU 400 KV TRANSMISSION LINES ADDITION**			
			Erection of 400 kV Quad Moose DC Line on DC towers between Rasipalayam 400 kV SS and Palavadi (Singarapet) 400 kV SS and 2 nos. bay provision at Palavadi 400 kV SS.	400	D/C	Work under progress
			Erection of 400 kV DC line on DC tower with Quad Moose conductor from Karaikudi 400 kV PGCIL SS to proposed Kamudhi 400 kV SS.	400	D/C	Work under progress
			400 kV DC line on DC towers with Quad Moose conductor from Kayathar 400 kV SS to the proposed Thennampatty 400 kV SS.	400	D/C	Tender under process
			LILO of one circuit of Thappagundu - Anaikadavu 400 kV DC line at Udumalpet 400/230 kV PGCIL SS	400	D/C	Tender under process
			Laying of 400 kV, 1x2500 sqmm DC UG cable from Manjakuppam point to the proposed Korattur substation.	400	D/C	Proposal for excluding cable package from JICA is under process and retender to be floated.
			Erection of 400 kV SC line on DC tower with Twin Moose conductor from the proposed Manali 400 kV SS and NCTPS stage -II 400 kV SS to the ETPS point.	400	S/C	Specification is under preparation
			Erection of 400 kV DC line on DC tower with Twin Moose conductor from ETPS common point to the Tondiarpet point.	400	D/C	Specification is under preparation
			Laying of 400 kV,1x2500 sq.mm DC UG cable feeder from Tondiarpet point to the proposed Pulianthope 400 kV SS(Manali & NCTPS stage-II)	400	D/C	OH Line is proposed instead of cable.
			Rearranging the already sanctioned 400 kV DC line from NCTPS Stage -II to Pulianthope as 400 kV DC line from North Chennai Pooling station to Pulianthope.	400	D/C	Estimate is under preparation

			Erection of 2x400 kV DC line by making LILO of Pugalur - Kalivanthapathu /Ottiyambakkam feeder 400 kV DC line with Quad Moose conductor at Ariyalur 765/400 kV SS.	400	D/C	Estimate is under preparation
			Erection of 400 kV DC Quad line by making LILO of Rasipalayam - Dharmapuri 400 kV DC line with Quad Moose conductor at the proposed Ariyalur 765/400 kV SS.	400	D/C	Estimate is under preparation
			Erection of 400 kV DC line on DC towers with Twin Moose conductor from the proposed Ariyalur 765 kV SS to Alandur 400 kV SS.	400	D/C	Estimate is under preparation
			Erection of 400 kV DC Quad Moose line on DC tower to make LILO of existing 400 kV Karaikudi - Pugalur feeder - I at the proposed Vellalaviduthi 400 kV SS	400	D/C	Estimate is under preparation
			Erection of 400 kV DC line on DC towers with Twin Moose conductor by making LILO of 400 kV Myvadi (Udumalpet) - Anaikadavu line at the proposed Edayarpalayam 400 kV SS.	400	D/C	Estimate is under preparation
			Erection of 400 kV SC line on DC towers with Twin Moose conductor from Anaikadavu 400 kV SS to the proposed Edayarpalayam 400 kV SS.	400	S/C	Estimate is under preparation
			Erection of 400 kV DC on DC tower with Twin Moose conductor by making LILO in one of the 400 kV Sunguvarchatram - Alamathy DC line upto Vellavedu towards Guindy.	400	D/C	Tender under process
			Laying of 400 kV ,1x2500 sqmm DC UG cable feeder from Vellavedu to the proposed Guindy 400 kV substation.	400	D/C	Proposal for excluding cable package from JICA is under process and retender to be floated.
			Erection of 400 kV SC on DC tower with Twin Moose conductor from sanctioned Sholinganallur 400 kV SS upto Perumbakkam Jn towards Guindy 400 kV substation.	400	S/C	Work under progress

			Laying of 400 kV ,1x2500 sqmm SC UG cable feeder from OH portion (Perumbakkam JN) (from sanctioned Sholinganallur 400 kV SS) to the proposed Guindy 400 kV substation.	400	S/C	Proposal for excluding cable package from JICA is under process and retender to be floated.
			Laying of 400 kV,1x2500 sq.mm DC UG cable feeder from the common point D (Kovilpadagai) to the proposed Korattur 400 kV SS to accommodate 400 kV Thervaikandigai - Korattur SC line and 400 kV Alamathy - Korattur SC line.	400	D/C	Proposal for excluding cable package from JICA is under process and retender to be floated.
SR	**KA-01**	**KARNATAKA**	**KARNATAKA 400 KV SYSTEM ADDITION**			
			Mylasandra (3x500) MVA	400/220	trf	
			Gulbarga (2x500) MVA	400/220	trf	
			C.N.Halli (2x500) MVA	400/220	trf	
			Dhoni (Gadag) (2x500) MVA	400/220	trf	
			Jagalur (2x500) MVA	400/220	trf	
			Devanahalli (3x500) MVA	400/220	trf	
			Narsapura (2x500) MVA	400/220	trf	
			Mugulkhod (2x500) MVA	400/220	trf	
			Shivanasamudram (2x315) MVA	400/220	trf	
SR	**KA-02**	**KARNATAKA**	**KARNATAKA 400 KV TRANSMISSION LINES ADDITION**			
			400 kV DC line from Kalburgi to YTPS with Quad Moose conductor	400	D/C	
			400 kV DC line from BPS to CN Halli with Quad Moose conductor	400	D/C	
			LILO of existing Nelmangala-Talaguppa line to C.N.Halli	400		
			Terminate 400 kV DC line feeding 400/220 kV Hassan from Nelmangala-Talaguppa line to C.N.Halli	400	D/C	
			SC LILO of Guddadadhalli (Munirabad) and Guttur (Davangere) lline with Twin Moose conductor to Dhoni	400	S/C	
			LILO of BPS - Chikkanayakanahalli with Quad Moose conductor to proposed 400 kV Jagalur s/s	400		
			400kV LILO of 400kV Somanahalli-Kolar SC line to Mylasandra.	400	S/C	

			SC LILO of 400 kV Hoody-Kolar Twin Moose lie to Prop. 400/220 kV Narsapura s/s	400	S/C	
			SC LILO of Narendra-Kudgi line to Prop. 400/220 kV Mugulkhod s/s	400	S/C	
			400 kV DC line with Twin Moose conductor from 400/220 kV Bastipura sub-station to Prop. 400/220 kV Shivanasamudram	400	D/C	
			400 kV DC line from proposed 400 kV Pavgada Pooling Station to Prop. 400 kV Devanahahalli sub-station	400	D/C	
			DC LILO of existing 400 kV Hoody-Nelamangala line to Prop. 400 kV Devanahahalli sub-station	400	D/C	
SR	**LD-01**	**LAKSHA DWEEP**	**DATA NOT SUBMITTED**			
WR	**MP-01**	**Madhya Pradesh**	**MP 400 KV SYSTEM ADDITION**			
			1. Balaghat/Kirnapur Substation(200 MVA)	400/132	Trf	work in progres s
			2. Badnawar Substation (2x315) MVA	400/220	Trf	work in progres s
			3. Sagar Substation (2x315) MVA	400/220	Trf	under proces s
			4. Mandsaur Substation (2x315) MVA	400/220	Trf	under proces s
			5. Ujjain Substation (2x315) MVA	400/220	Trf	under proces s
			6. DB Power TPS Substation (2x315) MVA	400/220	Trf	under proces s
			7. Bina Substation (1x315) MVA	400/220	Trf	under proces s
			8. Ashta Substation (1x315) MVA	400/220	Trf	to be tied up
			9. Indore Substation (1x315) MVA	400/220	Trf	to be tied up
WR	**MP-02**	**Madhya Pradesh**	**MADHYA PRADESH 400 KV TRANSMISSION LINES ADDITION**			
			LILO of Bhilai - Seoni for Balaghat 400 kV S/s DCDS	400	D/C	work in progres s

			LILO of both ckt Nagda - Rajgarh at Badnawar 400 kV S/s DCDS	400	D/C	work in progress
			Indore - Ujjain 400 kV D/C	400	D/C	under process
			LILO of one ckt of Khandwa - Rajgarh line at Chhegaon 400 kV S/s	400	D/C	under process
			Malwa(TPS-II) - Pithampur 400KV s/s at New PPSP	400	D/C	under process
			Pithampur - badnagar 400KV S/s	400	D/C	under process
			Astha - Ujjain 400 kV S/s	400	D/C	under process
			Nagda - Ujjain S/s	400	D/C	under process
			Nagda - Mandsaur S/s	400	D/C	under process
			LILO of one ckt of Satna - Bina 400 KV at Sagar s/s	400	D/C	under process
WR	**CG-01**	**CHHATTISGARH**	**CHHATTISGARH 400 KV SYSTEM ADDITION**			
			Jagdalpur Substation (2x315) MVA	400/220	Trf	Work under cprogress
			Dhamtari Substation (2x315) MVA	400/220	Trf	Work under cprogress
			Bilaspur Substation (2x315) MVA	400/220	Trf	Approved by CSERC
WR	**CG-02**	**CHHATTISGARH**	**CHHATTISGARH 400 KV TRANSMISSION LINES ADDITION**			
			LILO of 400 KV Raita-Jagdalpur DCDS Line at Dhamtari	400	D/C	approved by CSERC
			LILO of 400 KV Korba West-Bhilai Ckt-I at Bilaspur	400	D/C	approved by CSERC
			400 Kv Bilaspur-Sipat PGCIL DCDS Line at Bilaspur	400	D/C	approved by CSERC

WR	GJ-01	GUJARAT	GUJARAT 400 KV SYSTEM ADDITION			
			Zerda S/s (1x500) MVA	400/220	Trf	Approved by Board
			Chharodi (GIS) S/s (3x500) MVA	400/220	Trf	Approved by Board
			Soja S/s (1x500) MVA	400/220	Trf	Approved by Board
			Chorania S/s (1x500) MVA	400/220	Trf	Approved by Board
			Bhachunda (GIS) S/s (3x500) MVA	400/220	Trf	Approved by Board
			Up-gradation of 220 KV Vav to 400 KV level (GIS) (3x500) MVA	400/220	Trf	Approved by Board
			Fedra S/s (2x500) MVA	400/220	Trf	Approved by Board
			Bhogat S/s (3x500) MVA	400/220	Trf	Approved by Board
			Kasor S/s (4th ICT) (1x500) MVA	400/220	Trf	Approved by Board
			Kalavad S/s (2x500) MVA	400/220	Trf	Approved by Board
			Achhalia S/s (2x500) MVA	400/220	Trf	Approved by Board
			KV Prantij S/s (2x500) MVA	400/220	Trf	Approved by Board
			Shapar S/s (2x500) MVA	400/220	Trf	Approved by Board
			Keshod GIS S/s (2x500) MVA	400/220	Trf	Approved by Board
			Pipavav S/s (2x500) MVA	400/220	Trf	Approved by Board
			Chhara S/s (2x500) MVA	400/220	Trf	Approved by Board
			Chikhli S/s (2x500) MVA	400/220	Trf	Approved by Board
			S/s to be decided later (3x500) MVA	400/220	Trf	Addition of 500 MVA in each year

						from 2019-20 to 2021-22
WR	**GJ-02**	**GUJARAT**	**GUJARAT 400 KV TRANSMISSION LINES ADDITION**			
			Vadavi - Halvad line	400	D/C	work in progress
			400 KV S/C Adani - Hadala line LILO at Halvad	400	D/C	work in progress
			400 KV D/C Unit no.8 switchyard - existing switchyard	400	D/C	Approved by Board
			LILO one ckt of 400 KV D/C Kosamba - Chorania line at Chharodi s/s	400	D/C	work in progress
			Varsana - Halvad (Quad Moose)	400	D/C	work in progress
			Kasor - Amreli line (Quad Moose)	400	D/C	work in progress
			Wanakbori TPS - Soja	400	D/C	work in progress
			LILO of 400 KV S/C Wankabori - Soja line at 400 KV Dehgam s/s	400	D/C	NIT done
			Soja - Zerda line (Twin moose)	400	D/C	work in progress
			LILO of one circuit of 400 KV D/C Ukai - Kosamba line at Vav S/s	400	D/C	Tender under acceptance
			LILO of one circuit of 400 KV D/C Jhanor - Navsari line at Vav S/s	400	D/C	Tender under acceptance
			LILO of both circuits of 400 KV D/C Mundra – Zerda line at Charanka substation	400	D/C	Approved by Board
			Bhachunda - Varsana line	400	D/C	Approved by Board
			Adani - Zerda line-1	400	D/C	work in progress
			Shapar - Fedra line (twin moose)	400	D/C	NIT by Jul-16
			Hadala - Shapar line (Twin Moose)	400	D/C	NIT done
			LILO of one ckt of 400 KV D/C Kosamba - Chorania at 400 KV Fedra	400	D/C	work in progress

			LILO of one ckt of 400 KV D/C Halvad - Vadavi line at Chharod I s/s	400	D/C	Approved by Board
			Bhogat - Kalavad line	400	D/C	NIT done
			LILO of both circuits of 400 KV D/C Essar - Hadala line at Kalavad s/s	400	D/C	work in progress
			LILO of both circuits of proposed 400 KV D/C Kasor - Amreli line at Fedra s/s	400	D/C	Approved by Board
			400 KV S/C SSP - Asoj & 400 KV SSP-Kasor lines at Achhalia s/s (Twin moose)	400	D/C	Approved by Board
			LIL O of one ckt of proposed 400 KV D/C Wanakbori - Soja line at Prantij s/s	400	D/C	Approved by Board
			Sankhari - Prantij	400	D/C	Approved by Board
			Bhachunda - Bhuj Pool (PG) line	400	D/C	Approved by Board
			Shapoorji Pallonji generation station - Amreli line (Twin moose)	400	D/C	Approved by Board
			EPGL generating station - Halvad line (Twin moose)	400	D/C	Approved by Board
			Pipavav - Amreli	400	D/C	Survey done
			Chhara - Keshod line	400	D/C	Approved by Board
			LILO of both circuit of 400 KV D/C Kakrapar - Vapi (PG) line at 400 KV Chikhli substation (Twin Moose)	400	D/C	Approved by Board
			LILO of one circuit of planned 400 KV D/C Ukai -Kosamba line at new s/s near Chikhli	400	D/C	Approved by Board
NR	**HR-01**	**Haryana**	**Haryana 400 KV SYSTEM ADDITION**			
			Kaboolpur (1x315) MVA	400	Trf	
			Farakhnagar (2x315) MVA	400	Trf	In principle approved
			Qadarpur (2x500) MVA	400	Trf	NIT yet to be floated
			Sohna Road (2x500) MVA	400	Trf	NIT yet to be floated

NR	**HR-02**	**Haryana**	**Haryana 400 kV TRANSMISSION LINES ADDITION**			
			Lilo of 400 KV D/C Dhanoda - Daultabad line at Farukhnagar	400	D/C	NIT yet to be floated
NR	**UP-01**	**Uttar Pradesh**	**UP 765 KV SYSTEM ADDITION**			
			Modipuram(Meerut) (2x 1500) MVA	765/400/220	Trf	
			Moradabad(UP) (2x 1500) MVA	765/400/220	Trf	
NR	**UP-02**	**Uttar Pradesh**	**UP 400 KV SYSTEM ADDITION**			
			Modipuram(Meerut) (2x500) MVA	765/400/220	Trf	
			Moradabad(UP) (2x500) MVA	765/400/220	Trf	
			Firozabad (2x500) MVA	400/220/132	Trf	
			Shamli (2x500) MVA	400/220/132	Trf	
			Simbholi (2x500) MVA	400/220/132	Trf	
			Jaunpur(2x315) MVA	400/220/132	Trf	
			Sambhal(2x315) MVA	400/220/132	Trf	
			Rasra (2x500) MVA	400/220/132	Trf	
			Raebareli(2x315) MVA	400/220/132	Trf	
			Badaun(2x315) MVA	400/220/132	Trf	
			Lalu kheri (2x315) MVA	400/220/132	Trf	
			Bhopa Road (2x315) MVA	400/220/132	Trf	
NR	**UP-03**	**Uttar Pradesh**	**Uttar Pradesh 765 KV TRANSMISSION LINES ADDITION**			
			LILO of Gr. Noida(UP)-Hapur at Modipuram	765	D/C	
			LILO of Ghatampur-Hapur SC line at Moradabad	765	S/C	
			LILO of Anpara D- Unnao 765kV SC line at Obra c	765	S/C	
			LILO of Mainpuri-G.Noida 765kV SC line(M/s Cobra Line at I.R. Jawaharpur TPS	765	S/C	

			Ghatampur TPS-AgraUP 765kV SC Line	765	S/C	
			AgraUP-G.Noida 765kV SC Line	765	S/C	
			Ghatampur TPS- Hapur 765kV SC line	765	S/C	
NR	**UP-04**	**Uttar Pradesh**	**Uttar Pradesh 400 KV TRANSMISSION LINES ADDITION**			
			Moradabad(765)-Sambhal 400 kV DC Line	400	D/C	
			Moradabad(765)-Moradabad(400) DC Line	400	D/C	
			Sambhal-Badaun DC line	400	D/C	
			Sambhal-Moradabad(765) DC line	400	D/C	
			Jawahapur TPS-Firozabad 400 kV DC line	400	D/C	
			Agra(South)-Firozabad DC	400	D/C	
			Modipuram(765)-Bagphat(PGCIL) 400 kV DC Line	400	D/C	
			Modipuram(765)-Shamli DC	400	D/C	
			Simbholi-Modipuram(765) 400 kV DC line	400	D/C	
			Simbholi-Muradnagar-II	400	D/C	
			Obra-C -Jaunpur 400 kV DC	400	D/C	
			Varanasi(PG)-Janpur (400kV) DC line	400	D/C	
			LILO One Ckt Ballia (PG)-Mau or Ballia -Sohawal PG	400	S/C	
			Ballia (PG)-Rasra 400 kV SC Line	400	S/C	
			Jawahapur TPS-Firozabad 400 kV DC line	400	D/C	
			Panki TPS-Panki(400)-DC	400	D/C	
			LILO of one ckt of Aligarh-Sikandrabad 400kV DC line(Isolux line) at Harduaganj TPS	400	S/C	
			Obra C- Jaunpur 400kV DC line	400	D/C	
			LILO of one ckt of Obra-Jaunpur 400kV DC line at Obra(Existing)	400	D/C	
			Ghatampur TPS-KanpurPG 400kV DC line	400	D/C	
			Roza-Badaun DC line	400	D/C	
			Lalu kheri-Shamli DC line	400	D/C	
			Lalu Kheri-Bhopa Road DC line	400	D/C	
			LILO of VishnuPrayag-Srinagar-Muzzafarnagar	400	D/C	
			Bhopa Road- Nehtaur S/C line	400	S/C	

NR	**DL-01**	**Delhi**	**Delhi 400 KV SYSTEM ADDITION**			
			400 kV GIS at Shalimarbagh (North-West Delhi) (2000) MVA	400/220	Trf	
			400 kV GIS at Gopalpur (Central Delhi) (2x500) MVA	400/220	Trf	
			315 MVA (shifted from Bamnauli) bay installation at 400 kV Mundka(1x315) MVA	400/220	Trf	
			315 MVA addition along with bay additions at Abamnauli(1x315) MVA	400/220	Trf	
NR	**DL-02**	**Delhi**	**Delhi 400 KV TRANSMISSION LINES ADDITION**			
			Bawana- Shalimarbagh D/C line	400	D/C	
			LILO of Bawana to Rajghat 400 kV D/C at Gopalpur	400	D/C	
			LILO of 400 kV D/C Bamnauli-Tughlakabad at Rangpuri through 400 kV M/C O/H line	400	D/C	
NR	**UK-01**	**Uttarakhand**	**Uttarakhand 400 kV System Addition**			Data furnished for 2016-17 and 2017-18 only
NR	**UK-02**	**Uttarakhand**	**Uttarakhand 400 kV transmission line Addition**			
			400 kV D/C Srinagar 400 kV S/s Srinagar Power house line		D/C	
NR	**PB-01**	**Punjab**	**Punjab 400 KV SYSTEM ADDITION**			
			400 kV S/Stn Doraha (New at Vill. Dhanansu) (2x500) MVA	400/220	Trf	
NR	**PB-02**	**Punjab**	**Punjab 400 KV TRANSMISSION LINES ADDITION**			
			Nil			
NR	**HP-01**	**Himachal Pradesh**	**H P 400 kV System Addition**			
			Lahal(2x315) MVA	33/220/400	Trf	Work awarded
			Pragati nagar(1x315) MVA	220/400	Trf	Work awarded
			GIS S/s at Wangtoo(2x315) MVA	66/220/400	Trf	Work awarded
NR	**HP-02**	**Himachal Pradesh**	**H.P 400 kV transmission lines addition**			
			LILO of both circuits of 400 kV Jhakri- Abdullapur D/C line		D/C	Work awarded

			400 kV D/C line from 400/220 kV, 2X315 MVA Lahal GISS to 400/220 kV Chamera Pooling station of PGCIL		D/C	DPRs approved

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CHAPTER - 8

PERSPECTIVE TRANSMISSION PLAN UPTO 2036

8.1 BACKGROUND

8.1.1 A perspective transmission plan for 20 years (2014-2034) was prepared in August 2014 by CEA in association with CTU and POSOCO. The objective of the plan was to present a broad outline of the requirement of transmission system in the Indian grid in next 20 years. While this perspective plan has set up broad contour for the transmission requirement in the next 20 years, it was desired that detailed analysis for the immediate time-frame of 2021-22 may be carried out.

8.1.2 Classically, the need for development of transmission system arises from new generation additions, increase in demand and general system strengthening for better reliability. These development goals are achieved based on a definite implementable 'transmission plan'. The National Electricity Plan that would cover detailed generation programme and transmission plan for period up to 2022 i.e. the 13th five-year plan is under preparation. However, an 'Advance National Transmission Plan for Year 2021-22' has been prepared by CEA and submitted to the Ministry of Power vide letter no. 200/15/2016-PSPA-II/32 on 18-January-2016.

8.1.3 In the absence of affirmative information about new generation additions beyond 2021-22, the expected growth in load demand may serve as driving factor for a perspective transmission plan. Accordingly, a 'Perspective Transmission Plan for Year 2022-36' has been prepared based on initial indications of peak load demand projections and consequential generation addition requirements.

8.1.4 A perspective plan of next 20 years, in the Indian context, can provide some information on possible growth of broad inter-regional transmission corridors.

8.2 THE PERSPECTIVE PLAN

8.2.1 This report covers broad transmission corridors that may be required between 2022 to 2036 i.e. 8th year onwards and up to 20th year ahead. The generation plants that may come up in these 14 years (2022-36) are not known. The all-India peak demand is expected to rise from the current level of 153 GW to about 690 GW i.e. more than four(4) times by 2035-36. This implies roughly quadrupling the generation installed capacity as well as transmission systems of about 4 to 5 times the present capacities. The perspective plan for this period i.e. 2022-36 which includes 14th Plan, 15th Plan and first three years of 16th Plan, therefore, can at best be an indicative plan giving broad transmission corridors across various regions and possible international exchange corridors.

8.2.2 This assessment of indicative corridors requires an assessment of state-wise load growth and state-wise generation capacity additions of various fuel types i.e. coal, Gas nuclear, hydro, etc. to serve the load demand.

8.3 ASSESSMENT OF DEMAND:

8.3.1 Demand assessment is an essential prerequisite for planning of generation capacity addition and associated transmission infrastructure required to meet the future power requirement of various sectors of our economy. The type and location of power projects to be planned in the system is largely dependent on the magnitude, spatial distribution as well as the variation of demand during the day, seasons and on a yearly basis. Therefore, reliable planning for generation and transmission capacity addition for future is largely dependent on an accurate assessment of the future demand.

8.3.2 The 19th Electricity Power Survey Committee has been constituted with wide representation from the Stake-holders in the Power Sector, to forecast the demand for electricity both in terms of peak electric load and electrical energy requirement. CEA has been regularly bringing out the Electric Power Survey Reports. The last available report is the 18th Electric Power Survey (EPS) Report. Though the work on 19th EPS forecast is yet to be completed, a tentative estimate for period up to 2035-36 and the terminal years of the 13th, 14th and 15th Plan periods is given below:

(in MW)

State/UTs	14th Plan 2026-27	15th Plan 2031-32	For year 2035-36
Northern Region	106530	148900	195000
Western Region	112450	163100	217800
Southern Region	98210	146700	203400
Eastern Region	42770	63000	85800
North- Eastern Region	7020	10500	14000
Total All India (AI Peak)	**349500**	**506900**	**681900**

8.3.4 In addition to above, following peak **export demand** has also been assumed for neighbouring countries of SAARC region. Thus the total Peak load to be served from Indian grid is also given.

(in MW)

Neighbouring Country	14th Plan 2026-27	15th Plan 2031-32	For year 2035-36
SAARC Exports			
Bangladesh	1500	2000	2000
Nepal	400	500	500
Sri Lanka	0	500	1000
Pakistan	500	1000	1000
SAARC Exports	**2400**	**4000**	**4500**
Total All India + SAARC	**352000**	**511000**	**686000**

8.4 ASSESSMENT OF GENERATION CAPACITY:

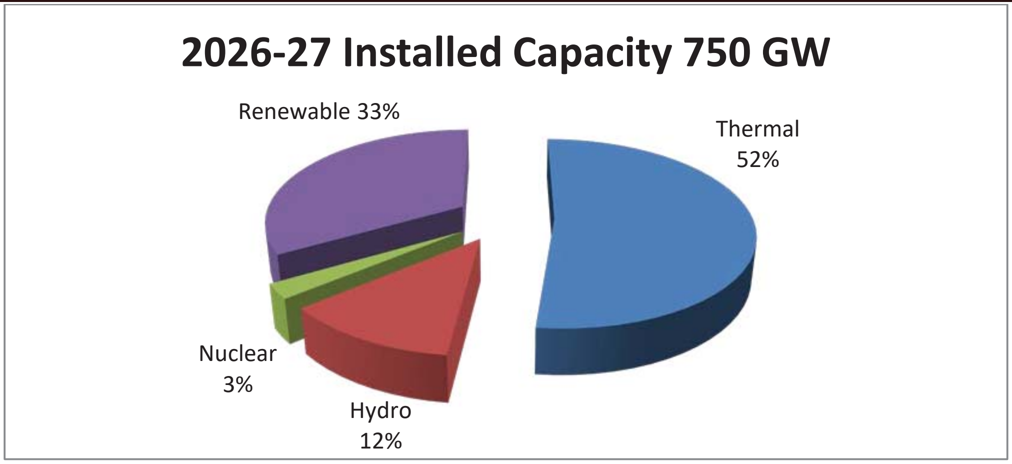
8.4.1 Generation capacity addition during a five year plan and the type-wise and region-wise(including the possible exportable capacity in neighbouring countries) for terminal year of each plan and for the year 2035-36 assumed for the purpose for this report are given below:

8.4.2 Generation Capacity for Year 2026-27(end of 14th Plan):

Following generation capacity, including importable generation capacity within SAARC countries, has been assumed for the terminal year of 14th five year plan i.e. for 2026-27:

(all figures in MW)

Regions	Thermal	Hydro	Nuclear	RES	Total
Northern	66956	27348	5920	66995	167218
Western	150694	9322	6380	77755	244151
Southern	87348	11747	6820	84964	190878
Eastern	81915	8084	0	18162	108161
North Eastern	2398	10658	0	2620	15675
ALL INDIA	**389311**	**67159**	**19120**	**250496**	**726083**
Bangladesh					
Nepal	0	10000	0	0	10000
Bhutan	0	14336	0	0	14336
SAARC Total	**0**	**24336**	**0**	**0**	**24336**
Total	**389311**	**91495**	**19120**	**250496**	**750419**

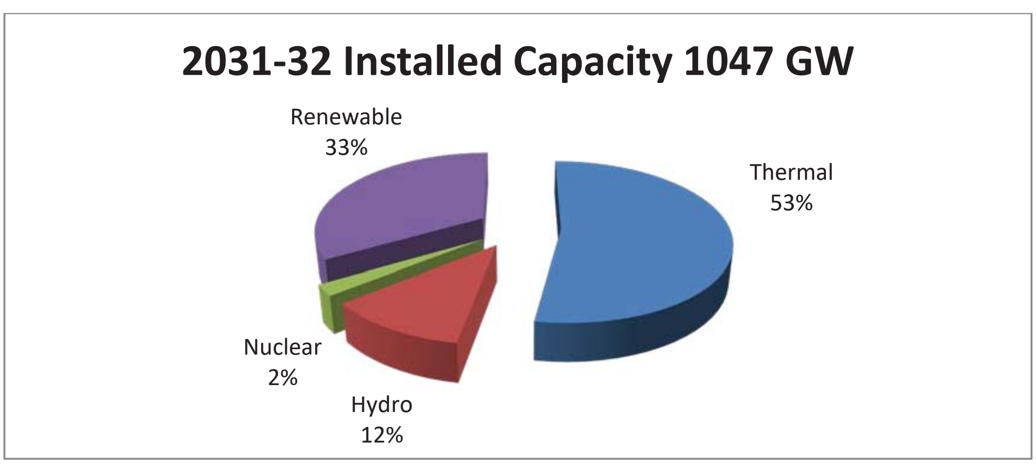


8.5 GENERATION CAPACITY FOR YEAR 2031-32 (END OF 15TH PLAN):

8.5.1 Following generation capacity, including importable generation capacity within SAARC countries, has been assumed for the terminal year of 15th five year plan i.e. for 2031-32:

(all figures in MW)

Regions	Thermal	Hydro	Nuclear	RES	Total
Northern	83266	28548	7320	93740	212873
Western	215934	9322	7780	108795	341831
Southern	119968	11857	8220	118883	258927
Eastern	130845	8244	0	25413	164502
North Eastern	2398	16688	0	3666	22751
ALL INDIA	**552411**	**74659**	**23320**	**350496**	**1000883**
Bangladesh					
Nepal	0	20000	0	0	20000
Bhutan	0	26336	0	0	26336
SAARC Total	**0**	**46336**	**0**	**0**	**46336**
Total	**552411**	**120995**	**23320**	**350496**	**1047219**

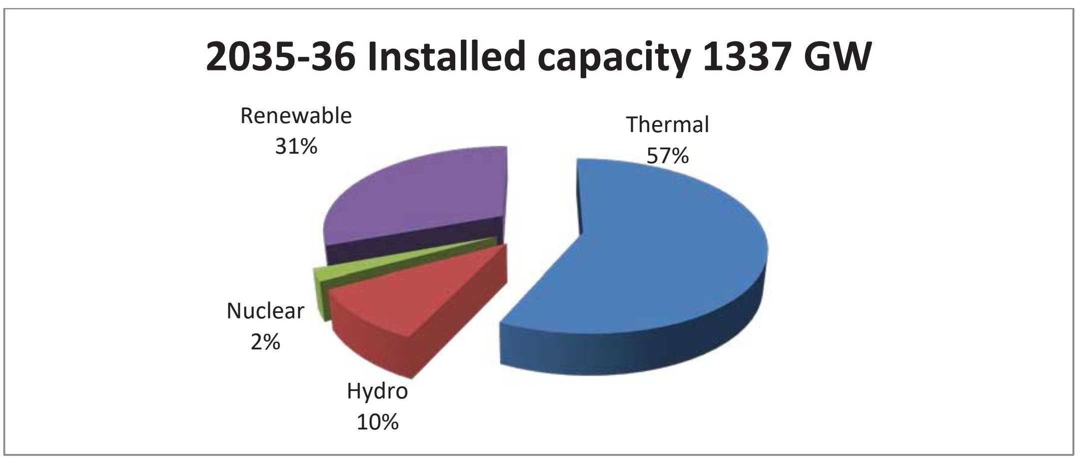


8.5.2 Generation Capacity for Year 2035-36 (in the 16th Plan):

Following generation capacity, including importable generation capacity within SAARC countries, has been assumed for the third year of 16th plan i.e. for 2035-36:

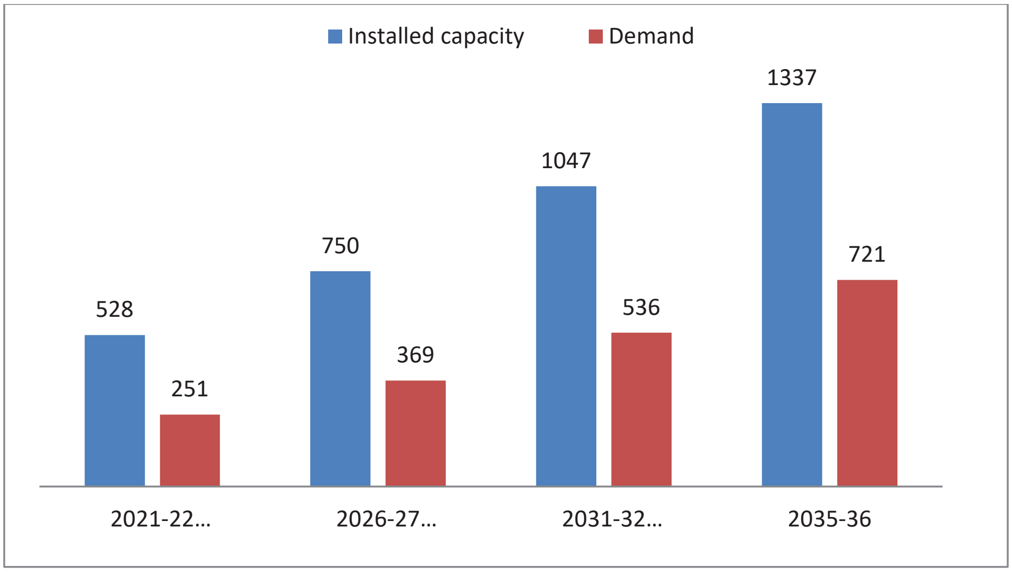
(all figures in MW)

Regions	Thermal	Hydro	Nuclear	RES	Total
Northern	104346	29818	8720	109786	252669
Western	300254	9342	7780	127419	444795
Southern	162128	11967	13220	139234	326548
Eastern	194085	8414	0	29763	232262
North Eastern	2398	23118	0	4294	29809
ALL INDIA	**763211**	**82659**	**29720**	**410496**	**1286083**
Bangladesh					
Nepal	0	25000	0	0	25000
Bhutan	0	26336	0	0	26336
SAARC Total	**0**	**51336**	**0**	**0**	**51336**
Total	**763211**	**133995**	**29720**	**410496**	**1337419**



8.5.3 A total picture of Load and Generation Capacity:

A relative growth of generation capacity with respect to the load demand, year-wise, is depicted below. The higher growth in the Installed capacity is due to increasingly higher Renewable energy capacity assumed for this analysis. The RE capacity not only has low PLF (about 20%) but also is not available during peak hours. The solar power is not available during the peak hours of (6- 9 pm), and the wind is available only during April-September months. Thus RE contributes lesser towards meeting the energy demand and the peak load demand.



8.6 ASSESSMENT OF TRANSMISSION CAPACITY REQUIREMENT:

8.6.1 The projection of generation and demand projection under different scenarios as estimated above for 2021-22, end of 14th Plan (2026-27), 15th Plan(2031-32) and 2035-36 time-frame are being used to find out the demand-generation surplus-deficit analysis for each region and for each quarter of the year.

8.6.2 The variation in generation dispatch and availability has been worked out for each quarter of the terminal years and would be discussed in subsequent paragraphs of this report.

8.6.3 In all of these analyses, following peak demand variation has been assumed for the five regions for each of the four quarters:

Region	Q-1	Q-2	Q-3	Q-4
NR	98.2%	100.0%	93.5%	91.7%
WR	93.9%	92.6%	96.2%	100.0%
SR	93.9%	91.4%	90.9%	100.0%
ER	93.7%	95.7%	94.6%	100.0%
NER	94.8%	96.0%	100.0%	99.9%
Bangladesh	100.0%	100.0%	100.0%	100.0%
Nepal	100.0%	100.0%	100.0%	100.0%
SriLanka	100.0%	100.0%	100.0%	100.0%
Pakistan	100.0%	100.0%	100.0%	100.0%
Bhutan	100.0%	100.0%	100.0%	100.0%

8.6.4 On the basis of the demand supply position, the requirement of flow of power between various regions has been worked out. The transmission corridors between the regions including the SAARC countries have been indicated which may be required to meet the need of the power transfer among various regions. The capacity of transmission corridors, thus assessed are based on only empirical analysis and therefore are only indicative in nature.

8.7 Transmission corridor capacity requirement for 2026-27

The quarter-wise demand-supply surplus/deficit for the year 2026-27 is given below:

8.7.1 First Quarter (i.e. Q1 of 2026-27):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	65%	50%	70%	15%
Western	65%	50%	70%	15%
Southern	65%	50%	70%	15%
Eastern	65%	50%	70%	15%
N. Eastern	65%	50%	70%	15%
Bangladesh	65%	50%	70%	15%
Nepal	65%	50%	70%	15%
SriLanka	65%	50%	70%	15%
Pakistan	65%	50%	70%	15%
Bhutan	65%	50%	70%	15%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/deficit
Northern	43789	13674	4144	10049	71656	104612	-32956
Western	98554	4661	4466	11663	119344	105591	13754
Southern	57126	5874	4774	12745	80518	92219	-11701
Eastern	53572	4042	0	2724	60339	40075	20263
N. Eastern	1568	5329	0	393	7290	6655	635
ALL INDIA	**254609**	**33580**	**13384**	**37574**	**339147**	**349153**	**-10005**
Bangladesh	0	0	0	0	0	1500	-1500
Nepal	0	5000	0	0	5000	400	4600
SriLanka	0	0	0	0	0	0	0
Pakistan	0	0	0	0	0	500	-500
Bhutan	0	7168	0	0	7168	0	7168
SAARC Total	**0**	**12168**	**0**	**0**	**12168**	**2400**	**9768**
Total	**254609**	**45748**	**13384**	**37574**	**351315**	**351553**	**-237**

8.7.2 Second Quarter (i.e. Q2 of 2026-27):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	62%	65%	70%	15%
Western	62%	65%	70%	15%
Southern	62%	65%	70%	15%
Eastern	62%	65%	70%	15%
North Eastern	62%	65%	70%	15%
Bangladesh	62%	65%	70%	15%
Nepal	62%	65%	70%	15%
SriLanka	62%	65%	70%	15%
Pakistan	62%	65%	70%	15%
Bhutan	62%	65%	70%	15%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	41312	17776	4144	10049	73281	106530	-33249
Western	92978	6059	4466	11663	115167	104129	11038
Southern	53894	7636	4774	12745	79048	89764	-10716
Eastern	50542	5255	0	2724	58521	40931	17590
North Eastern	1480	6928	0	393	8800	6739	2061
ALL INDIA	**240205**	**43653**	**13384**	**37574**	**334817**	**348093**	**-13276**
Bangladesh	0	0	0	0	0	1500	-1500
Nepal	0	6500	0	0	6500	400	6100
SriLanka	0	0	0	0	0	0	0
Pakistan	0	0	0	0	0	500	-500
Bhutan	0	9318	0	0	9318	0	9318
SAARC Total	**0**	**15818.4**	**0**	**0**	**15818.4**	**2400**	**13418.4**
Total	**240205**	**59472**	**13384**	**37574**	**350635**	**350493**	**142**

8.7.3 Third Quarter (i.e. Q3 of 2026-27):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	68%	50%	70%	10%
Western	68%	50%	70%	10%
Southern	68%	50%	70%	10%
Eastern	68%	50%	70%	10%
North Eastern	68%	50%	70%	10%
Bangladesh	68%	50%	70%	10%
Nepal	68%	50%	70%	10%
SriLanka	68%	50%	70%	10%
Pakistan	68%	50%	70%	10%
Bhutan	68%	50%	70%	10%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	45195	13674	4144	6699	69713	99606	-29893
Western	101718	4661	4466	7775	118621	108177	10444
Southern	58960	5874	4774	8496	78104	89273	-11169
Eastern	55293	4042	0	1816	61151	40460	20690
North Eastern	1619	5329	0	262	7210	7020	190
ALL INDIA	**262785**	**33580**	**13384**	**25050**	**334798**	**344536**	**-9738**
Bangladesh	0	0	0	0	0	1500	-1500
Nepal	0	5000	0	0	5000	400	4600
SriLanka	0	0	0	0	0	0	0
Pakistan	0	0	0	0	0	500	-500
Bhutan	0	7168	0	0	7168	0	7168
SAARC Total	**0**	**12168**	**0**	**0**	**12168**	**2400**	**9768**
Total	**262785**	**45748**	**13384**	**25050**	**346966**	**346936**	**30**

8.7.4 Fourth Quarter (i.e. Q4 of 2026-27):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	73%	40%	70%	10%
Western	73%	40%	70%	10%
Southern	73%	40%	70%	10%
Eastern	73%	40%	70%	10%
North Eastern	73%	40%	70%	10%
Bangladesh	73%	40%	70%	10%
Nepal	73%	40%	70%	10%
SriLanka	73%	40%	70%	10%
Pakistan	73%	40%	70%	10%
Bhutan	73%	40%	70%	10%

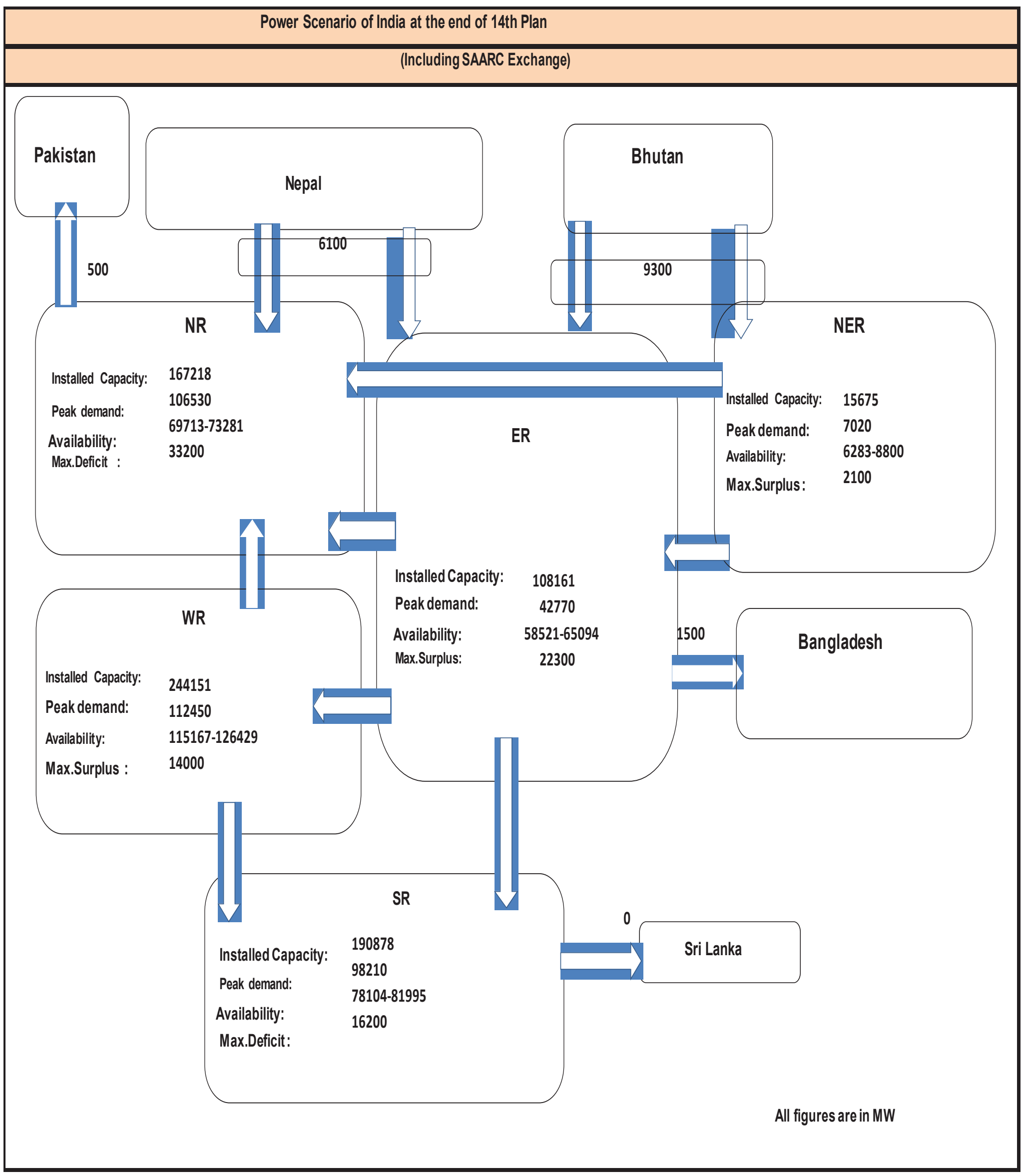
LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/deficit
Northern	49079	10939	4144	6699	70861	97688	-26827
Western	110459	3729	4466	7775	126429	112450	13979
Southern	64026	4699	4774	8496	81995	98210	-16215
Eastern	60044	3234	0	1816	65094	42770	22324
North Eastern	1758	4263	0	262	6283	7013	-730

ALL INDIA	**285365**	**26864**	**13384**	**25050**	**350662**	**358131**	**-7469**
Bangladesh	0	0	0	0	0	1500	-1500
Nepal	0	4000	0	0	4000	400	3600
SriLanka	0	0	0	0	0	0	0
Pakistan	0	0	0	0	0	500	-500
Bhutan	0	5734	0	0	5734	0	5734
SAARC Total	**0**	**9734.4**	**0**	**0**	**9734.4**	**2400**	**7334.4**
Total	**285365**	**36598**	**13384**	**25050**	**360397**	**360531**	**-134**

8.7.5 Accordingly, the transmission capacity requirement for 2026-27 (end of 14th Plan) may be assessed as given below:



8.8 Transmission corridor capacity requirement for 2031-32

The quarter-wise demand-supply surplus/deficit analysis for 2026-27 is given below:

8.8.1 First Quarter (i.e. Q1 of 2031-32):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	66%	50%	70%	20%
Western	66%	50%	70%	20%
Southern	66%	50%	70%	20%
Eastern	66%	50%	70%	20%
N. Eastern	66%	50%	70%	20%
Bangladesh	66%	50%	70%	20%
Nepal	66%	50%	70%	20%
SriLanka	66%	50%	70%	20%
Pakistan	66%	50%	70%	20%
Bhutan	66%	50%	70%	20%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	54706	14274	5124	18748	92852	146220	-53368
Western	141869	4661	5446	21759	173735	153151	20584
Southern	78819	5929	5754	23777	114278	137751	-23473
Eastern	85965	4122	0	5083	95170	59031	36139
N. Eastern	1575	8344	0	733	10653	9954	699
ALL INDIA	**362934**	**37330**	**16324**	**70099**	**486687**	**506107**	**-19420**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	10000	0	0	10000	500	9500
SriLanka	0	0	0	0	0	500	-500
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	13168	0	0	13168	0	13168
SAARC Total	**0**	**23168**	**0**	**0**	**23168**	**4000**	**19168**
Total	**362934**	**60498**	**16324**	**70099**	**509855**	**510107**	**-252**

8.8.2 Second Quarter (i.e. Q2 of 2031-32):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	62%	65%	70%	20%
Western	62%	65%	70%	20%
Southern	62%	65%	70%	20%
Eastern	62%	65%	70%	20%
North Eastern	62%	65%	70%	20%

Bangladesh	62%	65%	70%	20%
Nepal	62%	65%	70%	20%
SriLanka	62%	65%	70%	20%
Pakistan	62%	65%	70%	20%
Bhutan	62%	65%	70%	20%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	51791	18556	5124	18748	94220	148900	-54680
Western	134311	6059	5446	21759	167575	151031	16545
Southern	74620	7707	5754	23777	111858	134084	-22226
Eastern	81386	5359	0	5083	91827	60291	31536
North Eastern	1492	10847	0	733	13072	10080	2992
ALL INDIA	**343600**	**48528**	**16324**	**70099**	**478551**	**504385**	**-25834**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	13000	0	0	13000	500	12500
SriLanka	0	0	0	0	0	500	-500
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	17118	0	0	17118	0	17118
SAARC Total	**0**	**30118.4**	**0**	**0**	**30118.4**	**4000**	**26118.4**
Total	**343600**	**78647**	**16324**	**70099**	**508670**	**508385**	**284**

8.8.3 Third Quarter (i.e. Q3 of 2031-32):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	68%	50%	70%	15%
Western	68%	50%	70%	15%
Southern	68%	50%	70%	15%
Eastern	68%	50%	70%	15%
N. Eastern	68%	50%	70%	15%
Bangladesh	68%	50%	70%	15%
Nepal	68%	50%	70%	15%
SriLanka	68%	50%	70%	15%
Pakistan	68%	50%	70%	15%
Bhutan	68%	50%	70%	15%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	56371	14274	5124	14061	89830	139222	-49391
Western	146187	4661	5446	16319	172614	156902	15711
Southern	81218	5929	5754	17832	110733	133350	-22617
Eastern	88582	4122	0	3812	96516	59598	36918
North Eastern	1623	8344	0	550	10517	10500	17
ALL INDIA	**373982**	**37330**	**16324**	**52574**	**480210**	**499572**	**-19362**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	10000	0	0	10000	500	9500
SriLanka	0	0	0	0	0	500	-500
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	13168	0	0	13168	0	13168
SAARC Total	**0**	**23168**	**0**	**0**	**23168**	**4000**	**19168**
Total	**373982**	**60498**	**16324**	**52574**	**503378**	**503572**	**-194**

8.8.4 Fourth Quarter (i.e. Q4 of 2031-32):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	74%	40%	70%	15%
Western	74%	40%	70%	15%
Southern	74%	40%	70%	15%
Eastern	74%	40%	70%	15%
N. Eastern	74%	40%	70%	15%
Bangladesh	74%	40%	70%	15%
Nepal	74%	40%	70%	15%
SriLanka	74%	40%	70%	15%
Pakistan	74%	40%	70%	15%
Bhutan	74%	40%	70%	15%

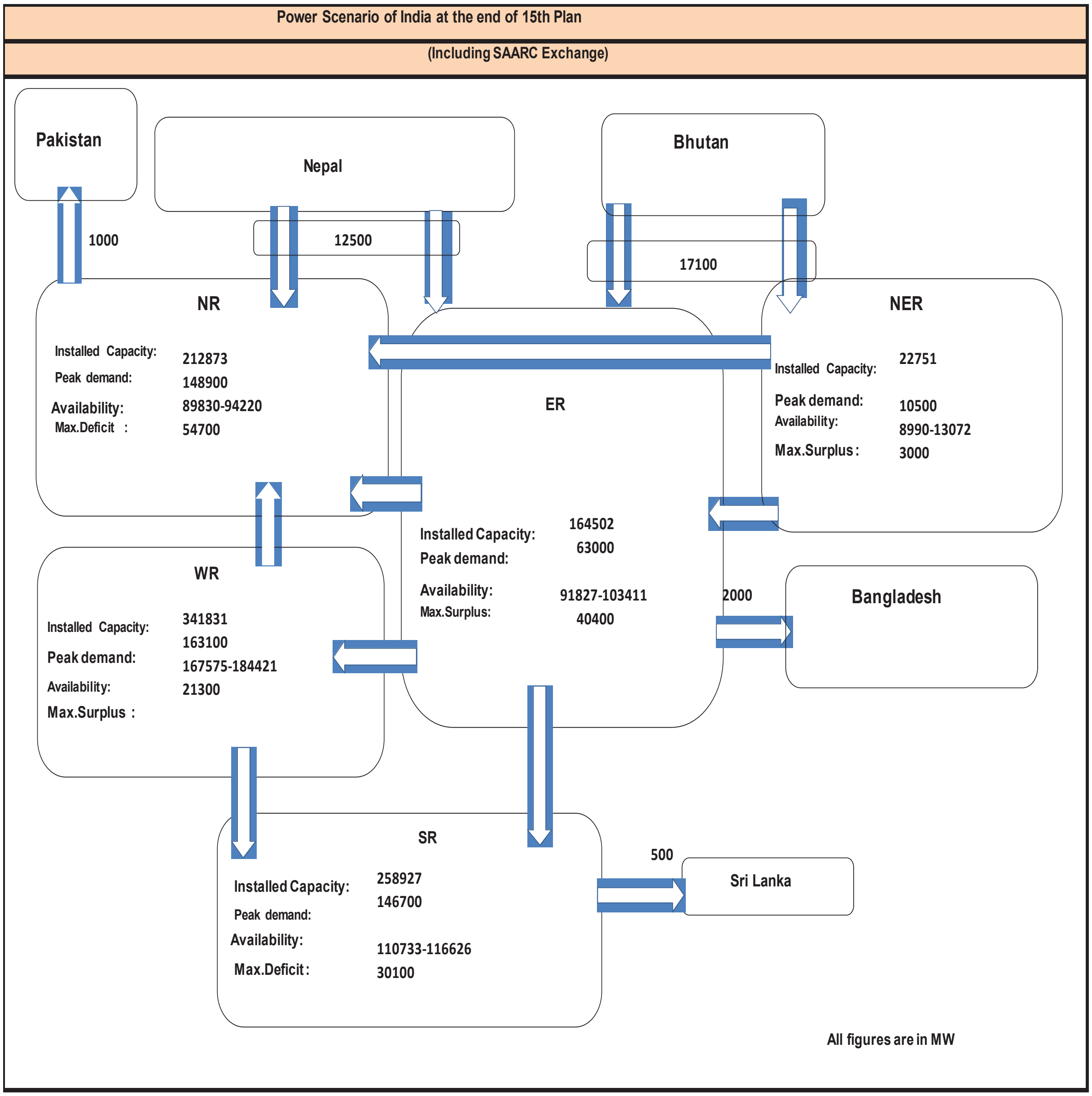
LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/deficit
Northern	61284	11419	5124	14061	91888	136541	-44653
Western	158927	3729	5446	16319	184421	163100	21321
Southern	88296	4743	5754	17832	116626	146700	-30074
Eastern	96302	3298	0	3812	103411	63000	40411
North Eastern	1765	6675	0	550	8990	10490	-1499
ALL INDIA	**406574**	**29864**	**16324**	**52574**	**505336**	**519831**	**-14494**
Bangladesh	0	0	0	0	0	2000	-2000

Nepal	0	8000	0	0	8000	500	7500
SriLanka	0	0	0	0	0	500	-500
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	10534	0	0	10534	0	10534
SAARC Total	**0**	**18534.4**	**0**	**0**	**18534.4**	**4000**	**14534.4**
Total	**406574**	**48398**	**16324**	**52574**	**523871**	**523831**	**40**

8.8.5 Accordingly, for 2031-32 (end of 15th Plan), the transmission capacity requirement may be assessed as given below:



8.9 TRANSMISSION CORRIDOR CAPACITY REQUIREMENT FOR 2035-36:

The quarter-wise demand-supply surplus/deficit analysis for 2035-36 is given below:

8.9.1 First Quarter (i.e. Q1 of 2035-36):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	68%	50%	70%	20%
Western	68%	50%	70%	20%
Southern	68%	50%	70%	20%
Eastern	68%	50%	70%	20%
N. Eastern	68%	50%	70%	20%
Bangladesh	68%	50%	70%	20%
Nepal	68%	50%	70%	20%
SriLanka	68%	50%	70%	20%
Pakistan	68%	50%	70%	20%
Bhutan	68%	50%	70%	20%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	70434	14909	6104	21957	113404	191490	-78086
Western	202671	4671	5446	25484	238272	204514	33758
Southern	109436	5984	9254	27847	152521	190993	-38472
Eastern	131007	4207	0	5953	141167	80395	60772
N. Eastern	1619	11559	0	859	14036	13272	764
ALL INDIA	**515167**	**41330**	**20804**	**82099**	**659400**	**680663**	**-21263**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	12500	0	0	12500	500	12000
SriLanka	0	0	0	0	0	1000	-1000
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	13168	0	0	13168	0	13168
SAARC Total	**0**	**25668**	**0**	**0**	**25668**	**4500**	**21168**
Total	**515167**	**66998**	**20804**	**82099**	**685068**	**685163**	**-95**

8.9.2 Second Quarter (i.e. Q2 of 2035-36):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	65%	65%	70%	20%
Western	65%	65%	70%	20%
Southern	65%	65%	70%	20%
Eastern	65%	65%	70%	20%
North Eastern	65%	65%	70%	20%
Bangladesh	65%	65%	70%	20%
Nepal	65%	65%	70%	20%

SriLanka	65%	65%	70%	20%
Pakistan	65%	65%	70%	20%
Bhutan	65%	65%	70%	20%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	67408	19382	6104	21957	114851	195000	-80149
Western	193964	6072	5446	25484	230966	201683	29283
Southern	104735	7779	9254	27847	149614	185908	-36294
Eastern	125379	5469	0	5953	136801	82111	54690
N. Eastern	1549	15027	0	859	17435	13440	3995
ALL INDIA	**493034**	**53728**	**20804**	**82099**	**649666**	**678141**	**-28475**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	16250	0	0	16250	500	15750
SriLanka	0	0	0	0	0	1000	-1000
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	17118	0	0	17118	0	17118
SAARC Total	**0**	**33368**	**0**	**0**	**33368**	**4500**	**28868**
Total	**493034**	**87097**	**20804**	**82099**	**683034**	**682641**	**393**

8.9.3 Third Quarter (i.e. Q3 of 2035-36):

Generation dispatch factors

Region	Thermal	Hydro	Nuclear	RES
Northern	69%	50%	70%	15%
Western	69%	50%	70%	15%
Southern	69%	50%	70%	15%
Eastern	69%	50%	70%	15%
N. Eastern	69%	50%	70%	15%
Bangladesh	69%	50%	70%	15%
Nepal	69%	50%	70%	15%
SriLanka	69%	50%	70%	15%
Pakistan	69%	50%	70%	15%
Bhutan	69%	50%	70%	15%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	72103	14909	6104	16468	109584	182325	-72741
Western	207476	4671	5446	19113	236705	209524	27182
Southern	112030	5984	9254	20885	148153	184891	-36738
Eastern	134113	4207	0	4464	142784	81167	61617

North Eastern	1657	11559	0	644	13860	14000	-140
ALL INDIA	**527379**	**41330**	**20804**	**61574**	**651087**	**671906**	**-20819**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	12500	0	0	12500	500	12000
SriLanka	0	0	0	0	0	1000	-1000
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	13168	0	0	13168	0	13168
SAARC Total	**0**	**25668**	**0**	**0**	**25668**	**4500**	**21168**
Total	**527379**	**66998**	**20804**	**61574**	**676755**	**676406**	**349**

8.9.4 Fourth Quarter (i.e. Q4 of 2035-36):

Generation dispatch factors

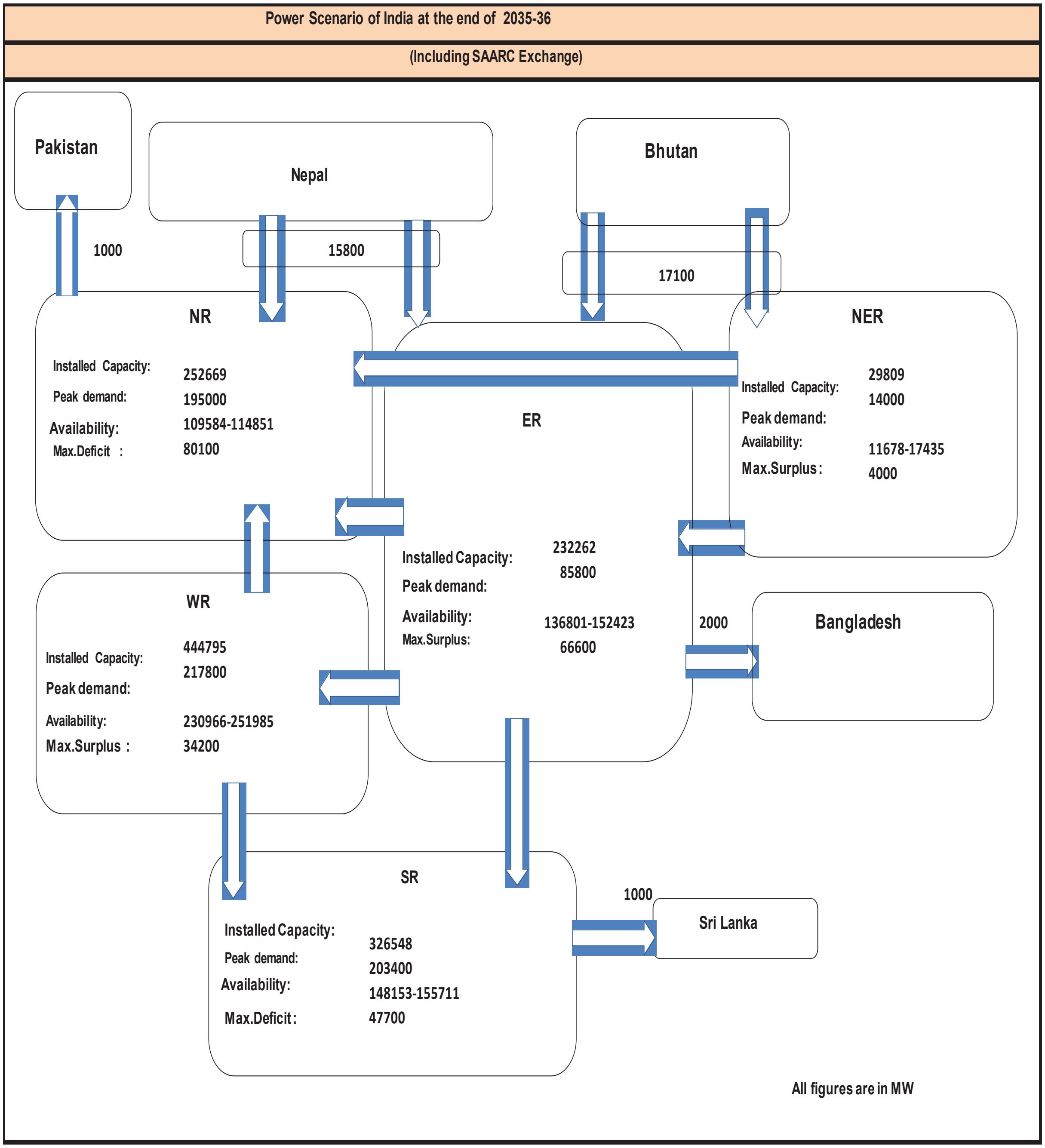
Region	Thermal	Hydro	Nuclear	RES
Northern	75%	40%	70%	15%
Western	75%	40%	70%	15%
Southern	75%	40%	70%	15%
Eastern	75%	40%	70%	15%
N. Eastern	75%	40%	70%	15%
Bangladesh	75%	40%	70%	15%
Nepal	75%	40%	70%	15%
SriLanka	75%	40%	70%	15%
Pakistan	75%	40%	70%	15%
Bhutan	75%	40%	70%	15%

LOAD GENERATION BALANCE ANALYSIS (ALL FIG. IN MW)

The Surplus/deficit for various regions is calculated as given below:

	Thermal	Hydro	Nuclear	RES	Total	Demand	surplus/ deficit
Northern	77738	11927	6104	16468	112237	178815	-66578
Western	223689	3737	5446	19113	251985	217800	34185
Southern	120785	4787	9254	20885	155711	203400	-47689
Eastern	144593	3366	0	4464	152423	85800	66623
North Eastern	1787	9247	0	644	11678	13986	-2308
ALL INDIA	**568592**	**33064**	**20804**	**61574**	**684034**	**699801**	**-15767**
Bangladesh	0	0	0	0	0	2000	-2000
Nepal	0	10000	0	0	10000	500	9500
SriLanka	0	0	0	0	0	1000	-1000
Pakistan	0	0	0	0	0	1000	-1000
Bhutan	0	10534	0	0	10534	0	10534
SAARC Total	**0**	**20534**	**0**	**0**	**20534**	**4500**	**16034**
Total	**568592**	**53598**	**20804**	**61574**	**704569**	**704301**	**268**

8.9.5 Accordingly, for 2035-36 (i.e. 20-years from now and by 3rd year of the 16th Plan), the transmission capacity requirement may be assessed as given below:



8.10 CONCLUSION:

8.10.1 The transmission corridor capacity requirements have been worked out based on advance estimates of peak load demand and preliminary assessment of region-wise generation addition possibility of next 20 years. It is seen that massive transmission corridors may be needed towards Northern and Southern regions. There is need to enhance hydro generation capacity in Northern and Southern regions to lessen this massive transmission system.

8.10.2 It is seen that the renewable energy sources contribute very less towards meeting peak load requirements. In view of large RE capacity addition being proposed, we would need to review, explore and adopt different approach to maintain load-generation balance and operation of grid.

8.10.3 As detailed in the report, the transmission capacity requirements considering export /import for various regions for the period 2022-36 is summarized below:

Region/SAARC	2026-27	2031-32	2035-36
Northern	-33200	-54800	-80100
Western	14000	21300	34200
Southern	-16200	-30100	-47700
Eastern	22300	40600	66600
North-east	2100	3000	4000
All INDIA	**-13400**	**-26000**	**-28500**
Bangladesh	-1500	-2000	-2000
Nepal	6100	12500	15800
Sri Lanka	0	-500	-1000
Pakistan	-500	-1000	-1000
Bhutan	9300	17000	17100
SAARC Total	13400	26000	28500

8.10.4 The transmission capacity requirements are sensitive to load growth and generation addition assumptions, especially when load growth may be in a range of 5-8 % per annum and location of generation additions of next 20 years can not be accurately ascertained. As such, these transmission capacity requirements are only indicative in nature.

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CHAPTER - 9

CROSS BORDER INTER-CONNECTION

9.1 CROSS BORDER POWER TRANSFER

The cross border power transfer by India with neighbouring countries is taking place through inter-Governmental bilateral cooperation. The planning of cross border interconnection, system operation, commercial agreement and Regulatory matters adopt the transaction as per bilateral agreement between Governments.

9.2 AGREEMENTS WITH NEIGHBOURING COUNTRIES

9.2.1 INDIA-BHUTAN

An agreement was signed between Government of the Republic of India and The Royal Government of Bhutan on the 28th day of July, 2006 on "COOPERATION IN THE FIELD OF HYDROELECTRIC POWER". The agreement, interalia, envisages development and construction of hydro power projects and associated transmission systems as well as trade in electricity between the two countries, both through public and private sector participation.

9.2.2 INDIA-BANGLADESH

A Memorandum of Understanding (MoU) was signed between Government of the Republic of India and Government of the People's Republic of Bangladesh on the 11'" day of January, 2010 on "COOPERATION IN POWER SECTOR". The MoU, interalia, envisages cooperation in power generation, transmission, energy efficiency, development of various types of renewable energy and establishment of grid connectivity between the two countries.

9.2.3 INDIA-Nepal

A Memorandum of Understanding (MoU) was also signed between the Government of Nepal and the Government of the Republic of India on the 21st October, 2014 on "Electric Power Trade, Cross-Border Transmission Interconnection and Grid Connectivity". The MoU, interalia, envisages cooperation in the power sector, including developing transmission interconnections, grid connectivity, power exchange and trading through the governmental, public and private enterprises of the two countries on mutually acceptable terms.

9.2.4 SAARC Framework Agreement

"SAARC Framework Agreement for Energy Cooperation (Electricity)" which was signed by member countries of SAARC during the 18th SAARC Summit held at Kathmandu, Nepal on 26-27 November, 2014. This Agreement, inter-alia, has enabling provisions for following:

i. Cross border trading of electricity on voluntary basis
ii. Planning of cross border grid interconnection by transmission planning agencies of the Governments through bilateral/trilateral/mutual agreements based on the needs of the trade in the foreseeable future through studies and sharing technical information required for the same.
iii. Building, owning, operating and maintaining the associated transmission system of cross-border interconnection falling within respective national boundaries and/or interconnected at mutually agreed locations.
iv. Joint development of coordinated network protection systems incidental to the cross-border interconnection to ensure reliability and security of the grids of the Member States.
v. Joint development of coordinated procedures for the secure and reliable operation of the inter-connected grids and to prepare scheduling, dispatch, energy accounting and settlement procedures for cross border trade.

9.3 EXISTING CROSS BORDER INTER-CONNECTIONS

9.3.1 India-Bhutan

Presently, about 1500 MW power from the existing hydro projects in Bhutan is being imported to India from Bhutan. The associated cross-border transmission system for evacuation and transfer of power from these HEPs is being operated in synchronism with the Indian Grid.

Chukha HEP (336MW):

i) Chukha (Bhutan)-Birpara 220 kV D/C (India/West Bengal)
ii) Chukha (Bhutan) –Birpara (West Bengal) via Singhigaon (Bhutan) 220 kV S/C

Kurichu HEP (60MW):

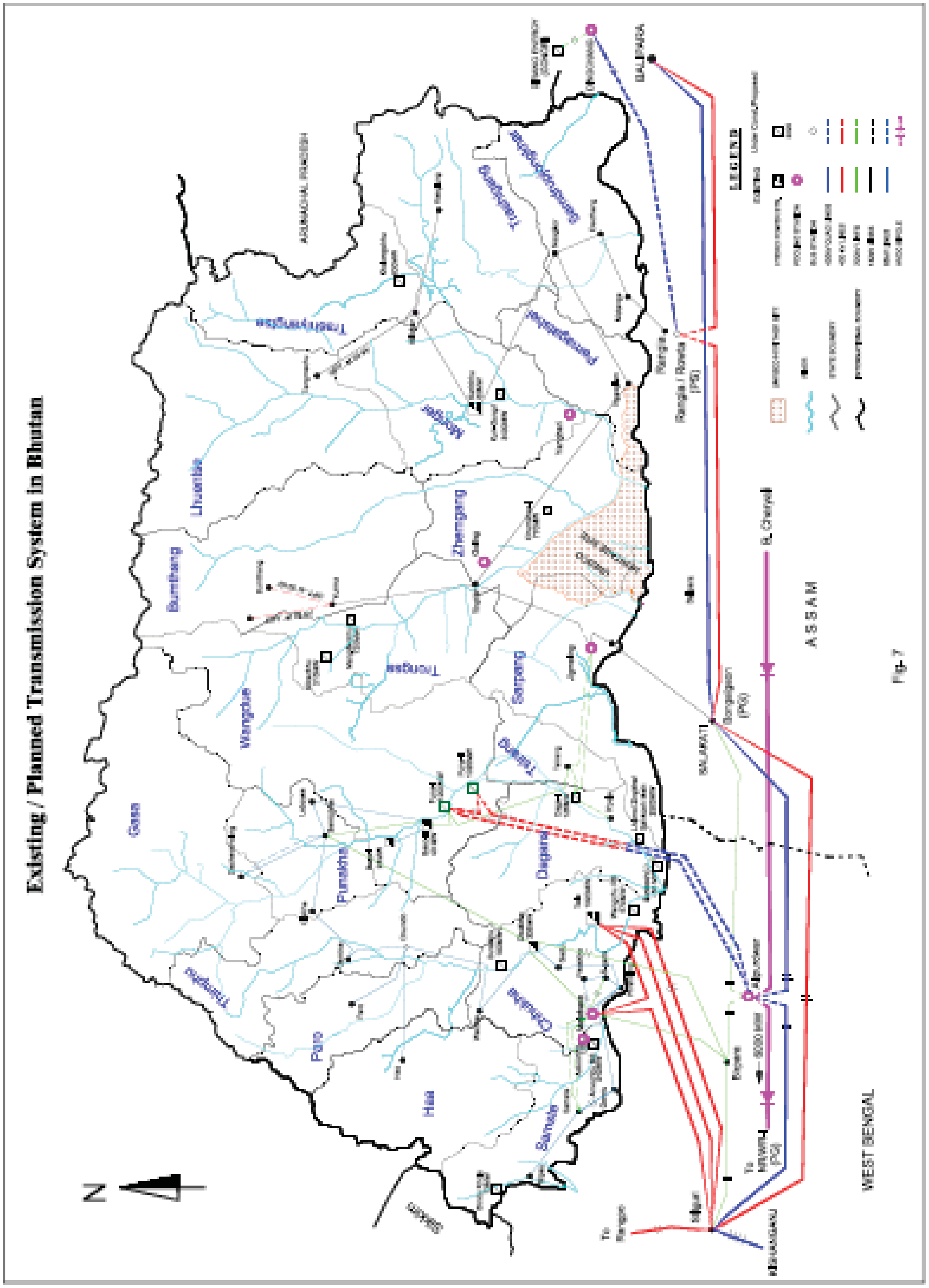
iii) Kurichu (Bhutan) –Gelephu (Bhutan)-Salakati (Assam) 132 kV S/C

Tala HEP (1020MW):

iv) Tala (Bhutan) – Siliguri (West Bengal) 400 kV 2xD/C lines (one of the circuit of a D/C line is LILOed at Malbase S/S in Bhutan

Dagachhu HEP (126 MW)

v) Power from Dagachhu HEP exported to India using transmission system associated with Chukha and Tala HEPs through Dagachhu-Tsirang-Rurichhu-Chukha 220 kV S/c



9.3.2 India- Bangladesh

1) A cross border electrical grid interconnection between India and Bangladesh, as given below, has developed and commissioned on 5th October, 2013. India is supplying to the extent of 500 MW power to Bangladesh through this interconnection as given below:

India portion

i) Baharampur (India)- Bheramara (Bangladesh) 400kV D/C line: 71 km

ii) LILO of Farakka - Jeerat 400kV S/C line at Baharampur: 3 km

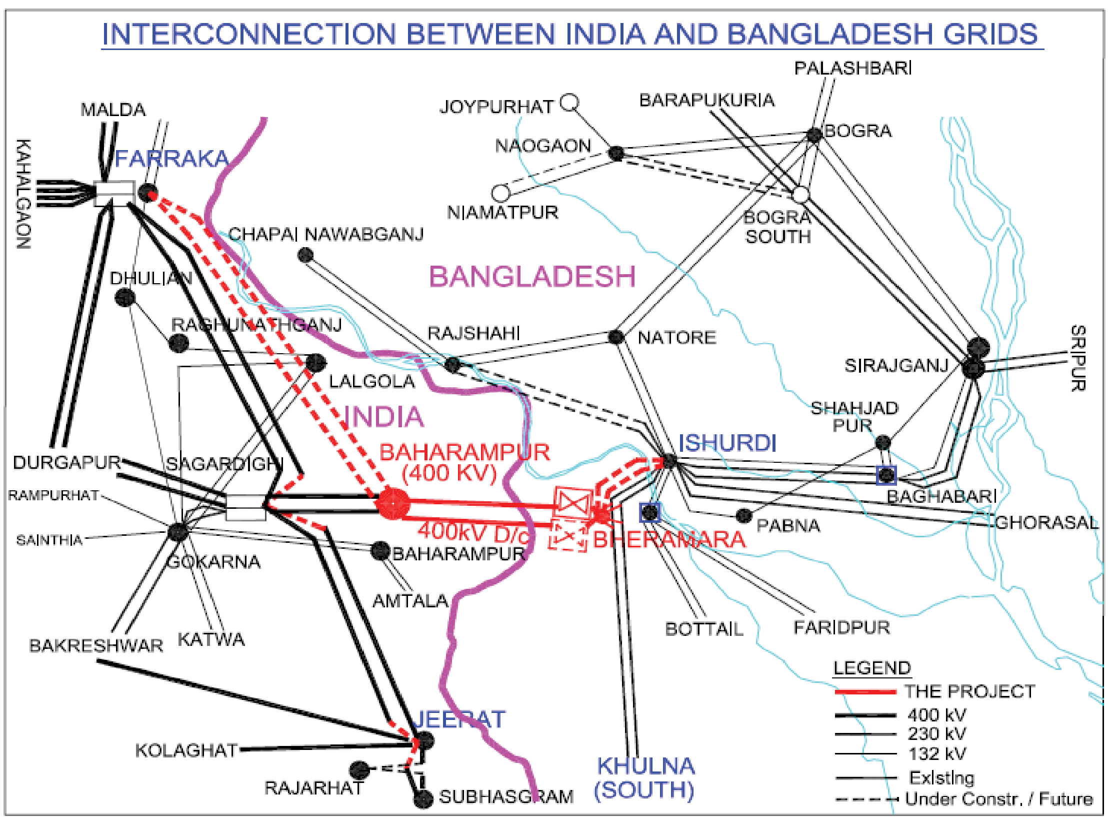
iii) Establishment of 400kV Switching Station at Baharampur

Bangladesh portion

i) Baharampur (India)-Bheramara (Bangladesh) 400kV D/C line : 27 km

ii) LILO of Ishurdi - Khulna South 230kV D/C line at Bheramara: 3 km

iii) Establishment of 500MW HVDC back-to-back Station and 230kV Switching Station at Bheramara



Additional interconnection from Surajmaninagar (Tripura) in India to Comilla in Bangladesh (400 kV D/c line charged at 132 kV) for radial power supply of about 100MW in eastern part of Bangladesh has been completed in December, 2015. Power flow to the tune of 80 MW has started since 17th March, 2016.

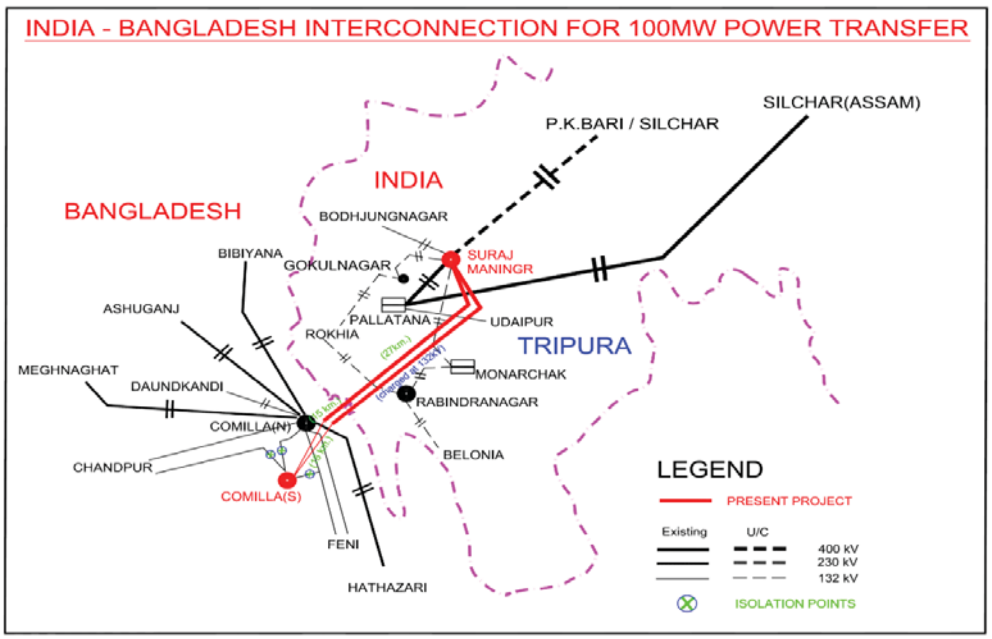
India portion

i) Surajmaninagar (Tripura) – Bangladesh border 400 kV D/C line (initially operated at 132 kV) - 27 km (Twin Moose Conductor)

Bangladesh portion

i) Indian Border- Comilla (North) 400 kV D/c line (initially operated at 132 kV)– 15 km (Twin Finch Conductor)

ii) Comilla (North) - Comilla (South) 132kV D/c line – 16km



9.3.3 India-Nepal

At present, Nepal is drawing about 320 MW of power from India through about 13 nos. cross border interconnections facilities at 11kV, 33kV and 132 kV voltage level. The details of which are given below:

Bihar (BSPTCL)-Nepal:

132 line

i) Kataiya – Kusaha S/C
ii) Ramnagar – Gandak / Surajpura(Nepal) S/C

33 kV line

iii) Kataiya – Inarwa (Biratnagar) S/C (not in service)
iv) Kataiya – Rajbiraj S/C
v) Jaynagar-Sirha (Bishnupur) S/C
vi) Sitamarhi – Jaleshwer S/C
vii) Raxaul-Birganj S/C

Uttar Pradesh (UPPCL)-Nepal:

33kV line

i) Nanpara-Nepalgunj S/C line

Uttarakhand (UPCL) – Nepal:

11kV line:

i) Pithoragarh – Baitadi line
ii) Dharchula – Jaljibe line
iii) Dharchula – Pipli line

NHPC-Nepal:

132 line

i) Tanakpur HEP-Mahendra Nagar S/C line

POWERGRID-Nepal

400 kV line

i) 400 kV Muzaffarpur (India) - Dhalkebar (Nepal) D/C line (initially charged at 132 kV)

9.3.4 India-Myanmar

India is providing about 2-3 MW of power (since 5th April 2016) from Manipur (India) to Myanmar through following transmission link:

(i) 11 kV transmission line from Moreh in Manipur (India) to Tomu town in Myanmar.

9.4 UNDER CONSTRUCTION CROSS BORDER INTER-CONNECTIONS

9.4.1 India-Bhutan

1) **Punatsangchhu-I (1200MW) HEP – ATS by Bhutan Power Corporation (BPC)** (Anticipated Commissioning by 2019-20).

Bhutan Portion

i) 400kV Punatsangchhu-I – Sankosh / Lhamoizingkha Twin Moose 2xD/C (one D/C routing via Punatsangchhu-II HEP) – 2018-19
ii) Sankosh- Alipurduar Quad Moose D/C line (First) (Bhutan portion) by 2018-19
iii) 400/220kV, 4X105MVA ICT at Punatsangchhu-I by 2019-20
iv) LILO of 220kVBosochhu-II – Tsirang S/C line at Punatsangchhu-I. by 2019-20
v) 1X80MVAr 420 kV Bus Reactor at Punatsangchhu-I by 2019-20

2) **Punatsangchhu II HEP (1020MW) – ATS by BPC** (Anticipated Commissioning by 2019-20)

i) Loop in Loop out (LILO) of one 400 kV D/C Punatsangchhu-I –Sankosh / Lhamoizngkha line at Punatsangchhu-II – by 2018-19
ii) 400 kV Punatsangchhu-II - Jigmeling D/C line – by 2018-19
iii) 1x80 MVAr 420 kV Bus Reactor at Punatsangchhu-II HEP by 2018-19.

3) **Mangdechhu (720MW) – ATS by BPC** (Anticipated Commissioning by 2018-19)

i) 400kV Mangdechhu- Goling 2x (S/C on D/C tower) lines with twin moose conductor (stringing of 2nd circuit in each line under Nikachhu HEP) - by 2017-18
ii) 400kV Goling–Jigmeling D/C line (1st ckt.) (Twin Moose)- by 2017-18
iii) 400kV Jigmeling - Alipurduar D/C Quad Moose line (Bhutan portion) – by July 2017
iv) 400/220kV, 4X167MVA Jigmeling pooling station (GIS) – by 2017-18
v) 1X80 MVAr, 420kV Bus Reactor at Mangdechhu – by 2017-18
vi) 1X80 MVAr, 420kV Bus Reactor at Jigmeling – By March 2017
vii) 132kV Mangdechhu-Yurmu D/C line by March 2017
viii) 400/132kV, 4X67 MVA ICT (1st) at Mangdechhu by 2017-18

Indian Portion

4) **Transmission links for import of power from Bhutan (By POWERGRID)**

i) LILO of ± 800kV, 6000MW Bishwanath Chariyali – Agra HVDC Bi-pole line at Alipurduar with 3000MW HVDC terminal with 400/220kV EHVAC station at Alipurduar - by Dec. 2016

ii) Extension of ± 800 kV HVDC station with 3000 MW inverter module at Agra - By Dec. 2016

iii) Bhutan Border (Sankosh)-Alipurduar Quad Moose 2xD/C line Bhutan Border (near Jigmeling) -Alipurduar Quad Moose D/C line

iv) LILO of Bongaigaon – Siliguri 400kV D/C Quad Moose line at Alipurduar LILO of Birpara-Salakati 220kV D/C line at Alipurduar

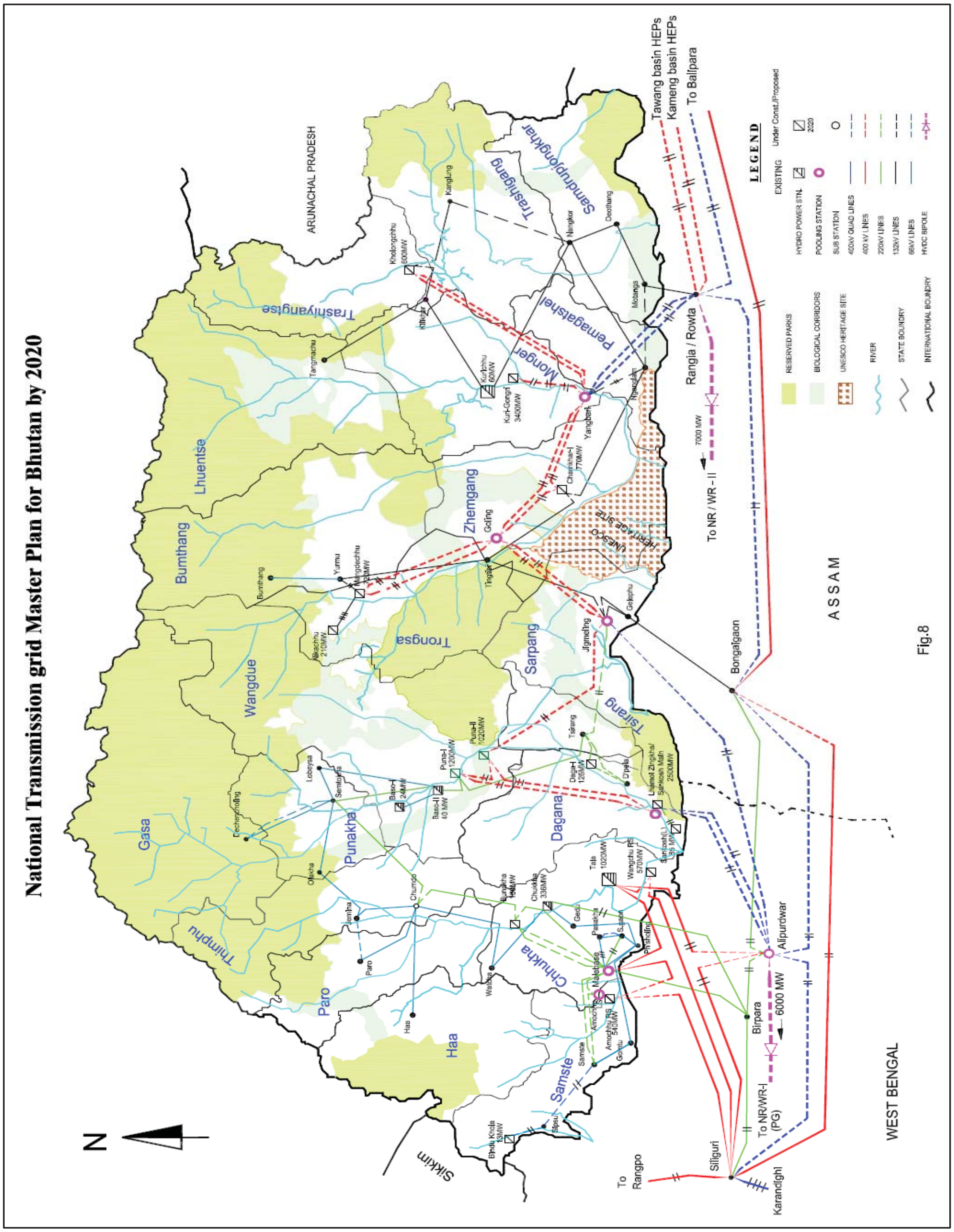


Fig.8

9.4.2 India-Bangladesh

1) For transfer of additional 500 MW from the existing Behrampur-Bheramara 400 kV D/C link following system strengthening works on Indian side (to be implemented by POWERGRID) and on Bangladesh side (to be implemented by PGCB) are under implementation. These works are expected to be completed by June 2017.

   Indian Side:

   i) 400 kV Farakka - Behrampur D/C (HTLS) line (about 70 km.)

   ii) Removal of the existing LILO of 400 kV Farakka - Jeerat S/c line at Beharampur.

   iii) LILO of the above Farakka-Jeerat 400 kV S/c line at Sagardighi.

   iv) LILO of Sagardighi-Subhasgram 400 kV S/c line at Jeerat

   Bangladesh Side:

   i) Bheramara - Ishurdi 230 kV D/c line – 12 km.

   ii) Additional 500 MW HVDC back-to-back converter unit (2nd module) at Bheramara (Bangladesh).

9.4.3 India-Nepal

1) Under the medium term measures for supply of additional power of about 100 MW to Nepal, following system strengthening works are under implementation by MEA through WAPCOS as consultant. The lines are expected to be completed by December 2016.

   i) New 132 kV Katiya – Kusaha S/C on D/C line with Panther conductor.

   ii) New 132 kV Raxaul – Parwanipur S/C on D/C line with Panther conductor.

2) Operation of 400 kV Muzaffarpur (India)-Dhalkebar (Nepal) D/C cross border line (initially operated at 132 kV) to 220 kV after commissioning of 220 kV Dhalkebar substation of Nepal – Dec., 2016.

3) Operation of 400 kV Muzaffarpur (India)-Dhalkebar (Nepal) D/C cross border line (initially operated at 132 kV) to 400 kV after commissioning of 400 kV Dhalkebar substation of Nepal – Dec., 2017.

9.5 FUTURE CROSS BORDER INTER-CONNECTIONS

9.5.1 India-Bangladesh

The transmission interconnection has been planned to connect Barapukuria/Parbotipur in Bangladesh to Katihar in ER and Bornagar in NER through 765kV D/c line to be initially operated at 400kV for supply of 500MW power to Bangladesh in Phase I. Bangladesh will draw the power at Barapukuria/Parbotipur through HVDC back to back for further dispersal of the same to their load centre. In Phase-II, this interconnection would be taken up for transfer of about 1000MW power to Bangladesh with upgradation of associated AC substations and upgradation of HVDC terminal at Parbotipur from 500MW to 1000MW. In this phase, the interconnecting line would be operated at its rated voltage depending on availability of power.

Accordingly, the following Scope of work was proposed:

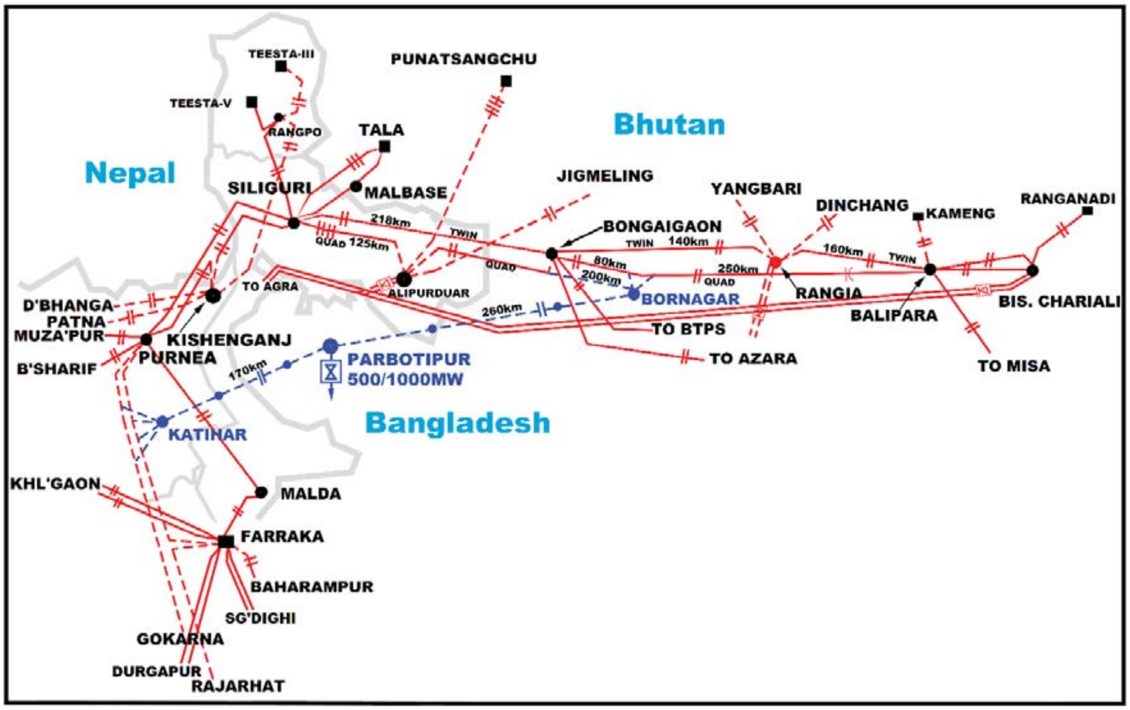
Phase-I: (2018-19)

i) 1x500MW HVDC back-to-back substation at Barapukuria/Parbotipur (Bangladesh) along with 400kV AC substation (upgradable to 765kV at a later date).
ii) New 400kV substation (upgradable to 765kV at a later date) at Bornagar (Assam) with LILO of Balipara – Bongaigaon 400kV D/c (quad) line.
iii) Disconnection of Alipurduar-Bongaigaon 400kV D/c (quad) line from Bongaigaon and extension of the same to Bornagar with 400kV D/c (quad) line so as to form Alipurduar-Bornagar 400kV D/c (quad) line.
iv) New 400kV substation (upgradable to 765kV at a later date) at Katihar (Bihar) with LILO of both ckts of Purnea – Rajarhat 400kV D/c (triple snowbird) line (one ckt via Gokarna and other ckt via Farakka).
v) Katihar (ER) – Parbotipur (Bangladesh) – Bornagar (NER) 765kV D/c line to be initially operated at 400KV [160 + 260 km]

Phase-II

i) Upgradation of HVDC back-to-back substation at Parbotipur (Bangladesh) by 1x500MW (total 2x500 MW)
ii) Upgradation of Katihar, Parbotipur, Bornagar substations from 400kV to 765kV.
iii) Operation of Katihar – Parbotipur – Bornagar 765kV D/c line at 765kV

Note: Phase-II would be taken up with the development of more generation projects in NER / northern part of ER. Additional system strengthening with Katihar & Bornagar in India and with Parbotipur in Bangladesh may be required to ensure 1000MW power supply and dispersal to Bangladesh.



9.5.2 India-Bhutan

As per the MOU signed between Govt. of India and Royal Govt. of Bhutan (RGoB) in December, 2009, ten no. of hydro projects with the total capacity of about 11,000 MW are to be developed in the different basins of Bhutan progressively by 2020. These projects are to be developed either as inter-governmental model or as a JV of PSU in India and corresponding organization in Bhutan. The DPRs of the above generation projects are being prepared by NTPC, NHPC, SJVNL, THDC, WAPCOS etc.

Subsequent to that an Intergovernmental Agreement has also signed between Govt. of India and Royal Govt. of Bhutan on 22nd April, 2014 for development of four no. HEPs namely Kholongchhu (600 MW), Wangchhu (570 MW), Chamkharchhu (770 MW) and Bunakha (180 MW) through JV of Indian PSU and Druk Green Power Corporation Limited, a PSU of RGoB. A master plan for evacuation of power from these projects has already been prepared by CEA. The project-wise transmission system is being taken up progressively matching with the commissioning schedule of the generation project.

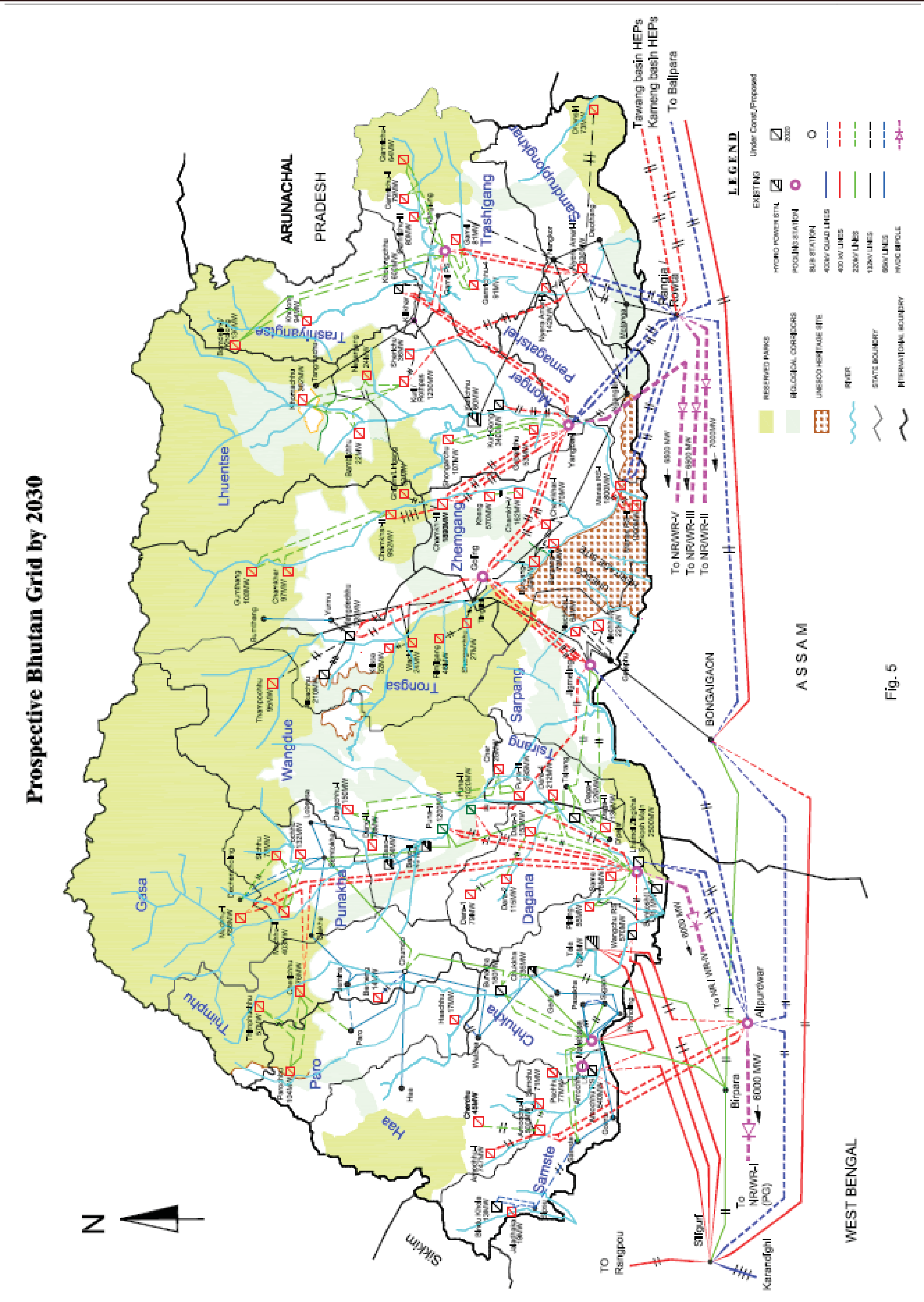
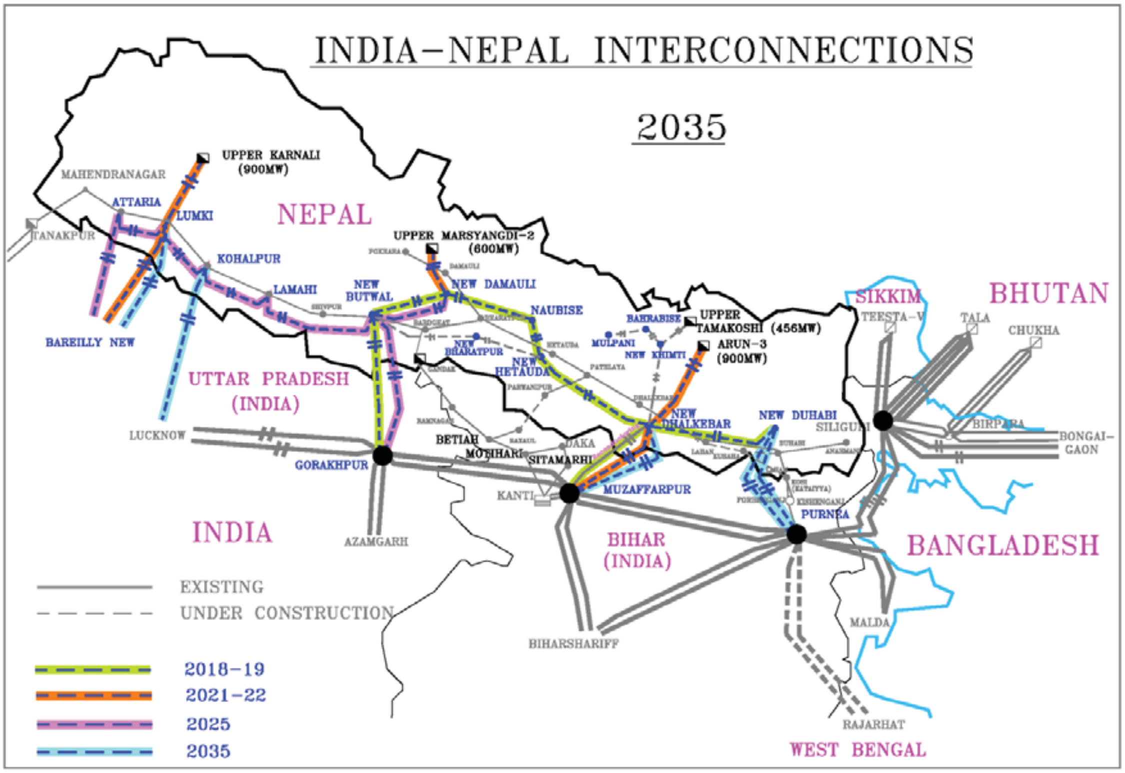


Fig. 5

9.5.3 India-Nepal

To further enhance power exchange with Nepal, a Joint Technical Team (JTT) comprising of experts from Nepal and India has been constituted. The JTT has prepared a long term integrated transmission plan for evacuation of power from the hydro power stations in Nepal and related cross border inter-connections between the two countries. The perspective plan, interalia, cover evacuation system from the hydroelectric projects likely to come up by 2025 and 2035 time frame. The plan also covers the details of high capacity cross border



interconnections required for evacuation of power from Nepal to India for different time frames. It is anticipated that by 2025 time frame Nepal would have an exportable surplus of about 13.2 GW which would increase to 24.9 GW by 2035 time frame. This excludes about 17.5 GW from three major projects in Nepal namely Karnali Chisapani (10,800 MW), Pancheshwar (3800 MW) and Saptkosi (3400 MW). The report envisages development of 400 KV D/C high capacity East-West power highway in Nepal i.e. New Duhabi-New Dhalkebar-New Hetauda-New Damauli-New Butwal-Lumki-Attaria by 2035 time frame. The report also envisages 11 no. high capacity cross border interconnections from different pooling points in Nepal. These interconnections would be taken up for implementation depending upon the progress of hydro projects and net exportable surplus power in Nepal.

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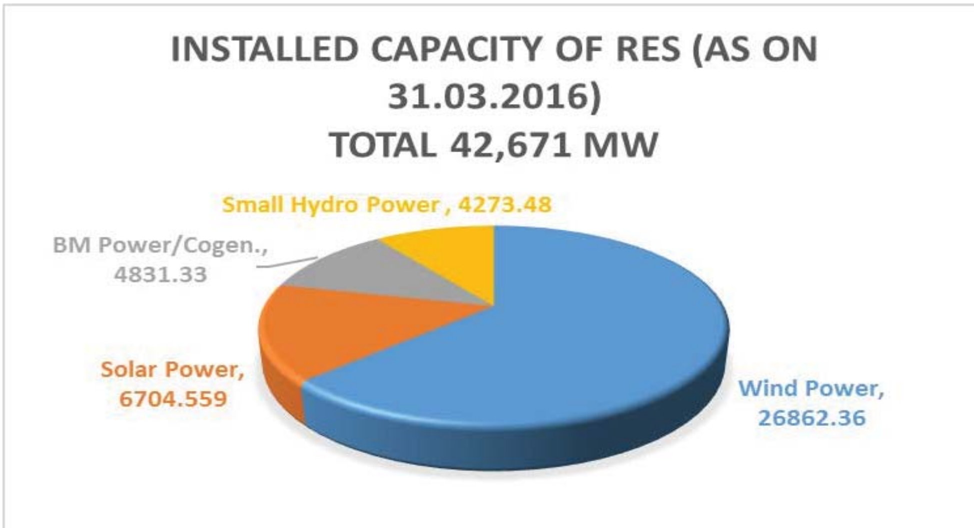
CHAPTER - 10

RENEWABLE ENERGY IN INDIA

10.1 PRESENT RENEWABLE ENERGY SCENARIO OF INDIA

10.1.1 Total existing installed RE capacity of India is 42671 MW (as on 31.03.2016)



Region-wise break-up of Renewable Power (As on 31.03.2016)

Region	Wind Power (MW)	Solar Power (MW)	BM Power/ Cogen. (MW)	Small Hydro Power (MW)	Total Capacity (MW)
Northern	3994	1890	1255	1452	8592
Western	10833	2382	1592	495	15296
Southern	12035	2331	1894	1777	18044
Eastern	0	96	89	290	475
North- Eastern	0	6	258	258	264
All India	**26862**	**6705**	**5088**	**4273**	**42671**

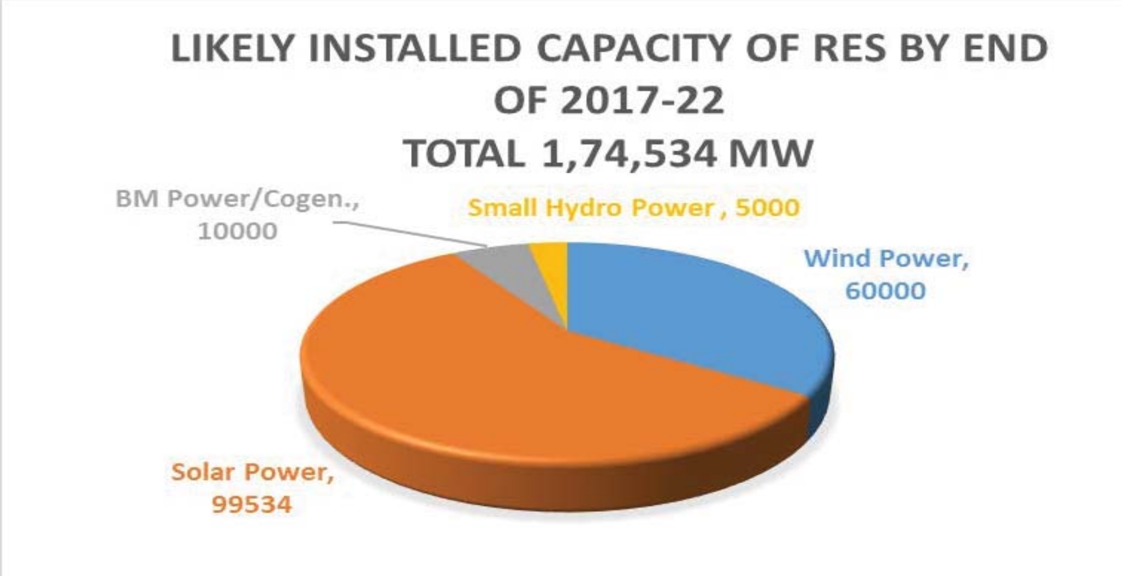
State-wise break-up of Renewable Power (As on 31.03.2016)

Region	State	Wind Power (MW)	Solar Power (MW)	BM Power/ Cogen. (MW)	Small Hydro Power (MW)	Total Capacity (MW)
WR	Chhattisgarh	0	93.58	279.9	52	425.48
WR	Gujarat	4037.5	1119.17	56.3	16.6	5229.57
WR	Madhya Pradesh	2141.1	776.37	35	86.16	3038.63
WR	Maharashtra	4654.15	385.75	1220.78	339.88	6600.56
WR	Goa	0	0	0	0.05	0.05
SR	Andhra Pradesh	1431.45	572.96	380.75	232.98	2618.14
SR	Tamil Nadu	7613.86	1061.82	641.9	123.05	9440.63
SR	Telangana	77.7	527.84	0	0	605.54
SR	Karnataka	2869.15	145.462	872.18	1217.73	5104.52
SR	Kerala	43.5	13.04	0	198.92	255.46
SR	Puducherry	0	0.025	0	0	0.025
NR	Delhi	0	14.28	0	0	14.28
NR	Haryana	0	15.39	45.3	73.5	134.19
NR	Himachal Pradesh	0	0.2	0	793.31	793.51
NR	Jammu & Kashmir	0	1	0	156.53	157.53
NR	Punjab	0	405.06	155.5	170.9	731.46
NR	Rajasthan	3993.95	1269.93	108.3	23.85	5396.03
NR	Uttar Pradesh	0	143.5	870	25.1	1038.6
NR	Uttarakhand	0	41.15	76	209.33	326.48
NER	Assam	0	0	0	34.11	34.11
NER	Meghalaya	0	0	0	31.03	31.03
NER	Tripura	0	5	0	16.01	21.01

Region	State	Wind Power (MW)	Solar Power (MW)	BM Power/ Cogen. (MW)	Small Hydro Power (MW)	Total Capacity (MW)
NER	Arunachal Pradesh	0	0.27	0	104.61	104.88
NER	Manipur	0	0	0	5.45	5.45
NER	Mizoram	0	0.1	0	36.47	36.57
NER	Nagaland	0	0	0	30.67	30.67
ER	Bihar	0	5.1	43.42	70.7	119.22
ER	Jharkhand	0	16.19	0	4.05	20.24
ER	Odisha	0	66.92	20	64.63	151.55
ER	West Bengal	0	7.77	26	98.5	132.27
ER	Sikkim	0	0	0	52.11	52.11
	Andaman Nicobar	0	5.1	0	5.25	10.35
	Lakshwadeep	0	0.75	0	0	0.75
NR	Chandigarh	0	6.81	0	0	6.81
WR	Dadar & Nagar Haveli	0	0	0	0	0
WR	Daman & Diu	0	4	0	0	4
	All India	**26862.36**	**6704.56**	**4831.33**	**4273.48**	**42671.73**

10.2 PROPOSED RENEWABLE ENERGY CAPACITY

10.2.1 India has set a target for establishing about 175 GW renewable generation capacity by 2021-22 including 100 GW Solar, 60 GW wind and remaining small hydro and Bio mass. Future projection of RE generation capacity , region-wise and state-wise, which is being targeted by 2021-22 is given below:



10.2.2 Anticipated Region-wise break-up of Renewable Power by 2021-22

Region	Wind Power (MW)	Solar Power (MW)	BM Power/ Cogen. (MW)	Small Hydro Power (MW)	Total Capacity (MW)
Northern	8600	31026	4149	2450	46165
Western	22900	27822	2875	125	53362
Southern	28500	26531	2612	1675	59018
Eastern	0	12237	244	135	12616
North-Eastern	**0**	**1206**	**0**	**615**	**1821**
All India	**60000**	**98822**	**9880**	**5000**	**172982**

10.2.3 State-wise break-up of Renewable Power by year 2021-22

Region	State	Wind Power (MW)	Solar Power (MW)	BM Power/ Cogen. (MW)	Small Hydro Power (MW)	Total Capacity (MW)
WR	Chhattisgarh	0	1783	0	25	1808
WR	Gujarat	8800	8020	288	25	17133
WR	Madhya Pradesh	6200	5675	118	25	12018
WR	Maharashtra	7600	11926	2469	50	22045
WR	Goa	0	358	0	0	358
SR	Andhra Pradesh	8100	9834	543	0	18477
SR	Tamil Nadu	11900	8884	649	75	21508

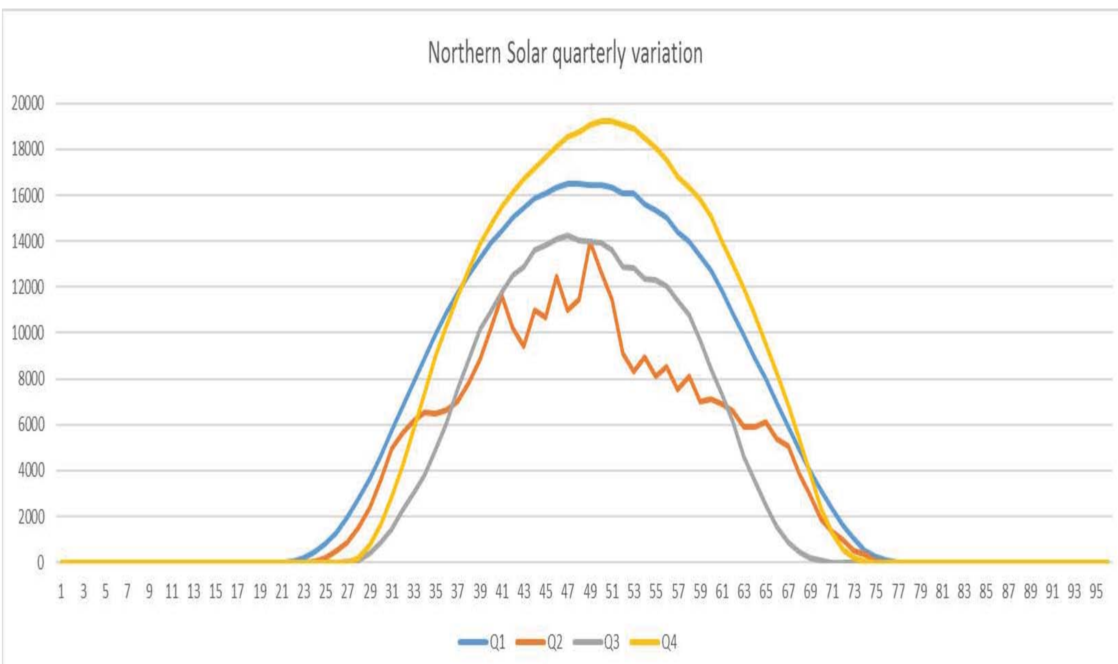
Region	State	Wind Power (MW)	Solar Power (MW)	BM Power/ Cogen. (MW)	Small Hydro Power (MW)	Total Capacity (MW)
SR	Telangana	2000	0	0	0	2000
SR	Karnataka	6200	5697	1420	1500	14817
SR	Kerala	0	1870	0	100	1970
SR	Puducherry	0	246	0	0	246
NR	Delhi	0	2762	0	0	2762
NR	Haryana	0	4142	209	25	4376
NR	Himachal Pradesh	0	776	0	1500	2276
NR	Jammu & Kashmir	0	1155	0	150	1305
NR	Punjab	0	4772	244	50	5066
NR	Rajasthan	8600	5762	0	0	14362
NR	Uttar Pradesh	0	10697	3499	25	14221
NR	Uttarakhand	0	900	197	700	1797
NER	Assam	0	663	0	25	688
NER	Meghalaya	0	161	0	50	211
NER	Tripura	0	105	0	0	105
NER	Arunachal Pradesh	0	39	0	500	539
NER	Manipur	0	105	0	0	105
NER	Mizoram	0	72	0	25	97
NER	Nagaland	0	61	0	15	76
ER	Bihar	0	2493	244	25	2762
ER	Jharkhand	0	1995	0	10	2005
ER	Odisha	0	2377	0	0	2377
ER	West Bengal	0	5336	0	50	5386
ER	Sikkim	0	36	0	50	86
	AndamanNicobar	0	27	0	0	27
	Lakshwadeep	0	4	0	0	4
NR	Chandigarh	0	153	0	0	153
WR	Dadar & Nagar Haveli	0	449	0	0	449
WR	Daman & Diu	0	199	0	0	199
	others(New States)	600	0	120	0	720
	All India	**60000**	**99534**	**10000**	**5000**	**174534**

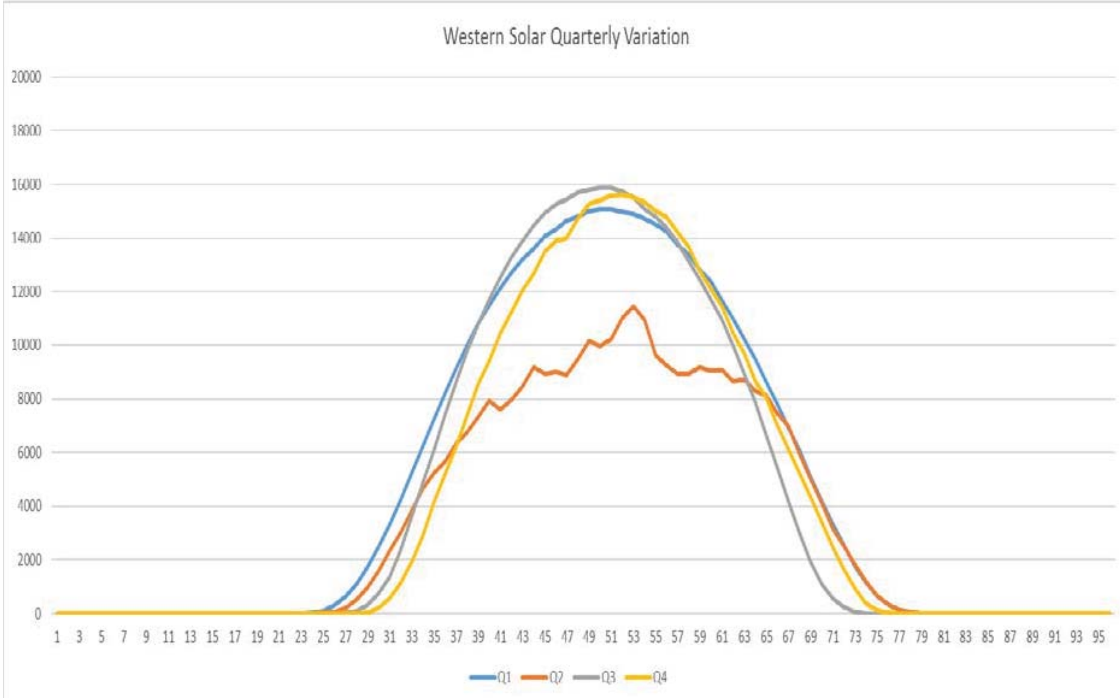
10.2.4 It is this capacity, which is to be integrated with our national grid. For planning effective integration into the grid, adequate transmission system that would not only facilitate evacuation of power from plant-based RES generations, but also the transmit power despatched from RES plants and roof-top generations in surplus states/regions to deficit states/regions. Also, as the despatches from RES especially wind and solar plants are variable in nature, the effective integration of 175 GW is possible only if we also plan for adequate balancing capacity to maintain load-generation balance at all times. This requires determination of balancing capacity through statistical analysis of projected variability of at least 160 GW (i.e. wind 60 GW and solar 100 GW) in year 2021-22.

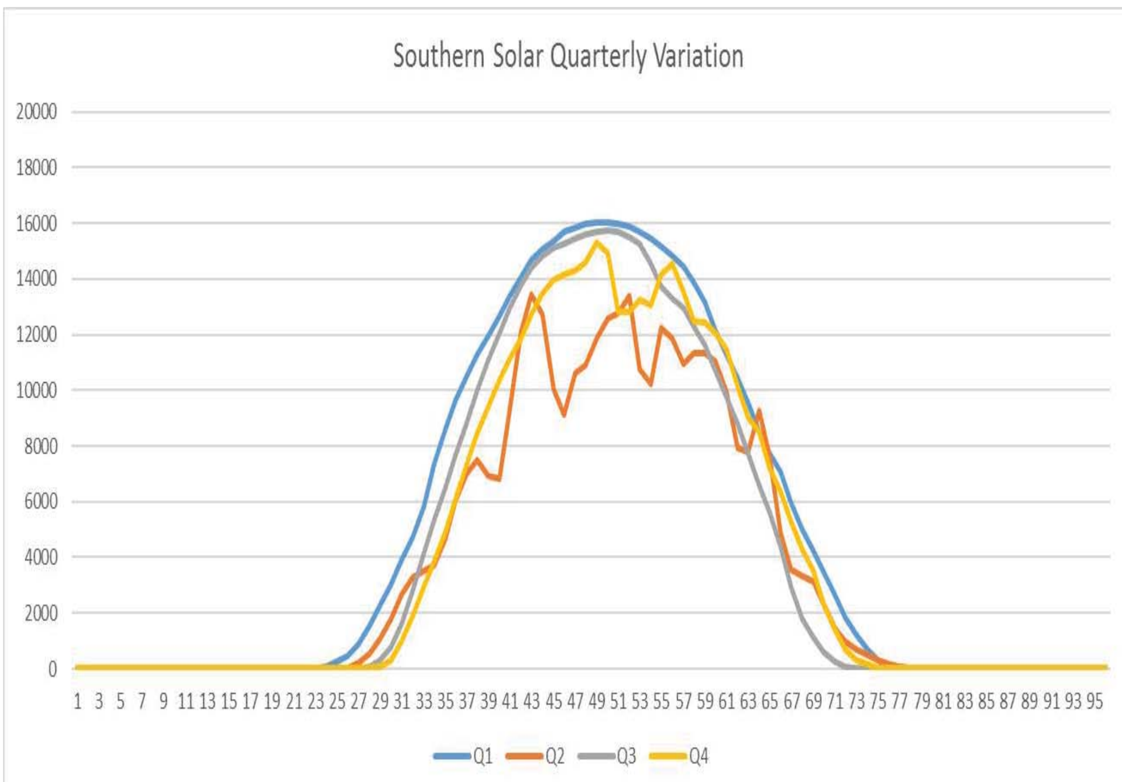
10.3 BEHAVIOUR OF SOLAR AND WIND

10.3.1 Wind and Solar, provide variable energy output that depends on the time of day, location, season, weather, and other factors. Data for wind & solar has been collected from various source. The projected behaviour of 160 GW of wind and solar generation in 2021-22 has been arrived at through scaling up of behaviour of existing plants, considering longitudinal and latitudinal aspects and random statistical tools. For Solar energy generation forecasting we aggregate the output of large number of solar plant after varying data as per longitude and latitude of that geographical area. For wind it's very difficult to predict wind energy as it highly variable. We collected data of multiple wind generators and scaled up it for 60 GW region-wise. Aggregation of multiple generation sites over a larger geographical area results in even lesser variability. Region wise quarterly variation of wind and solar is given in following graph.

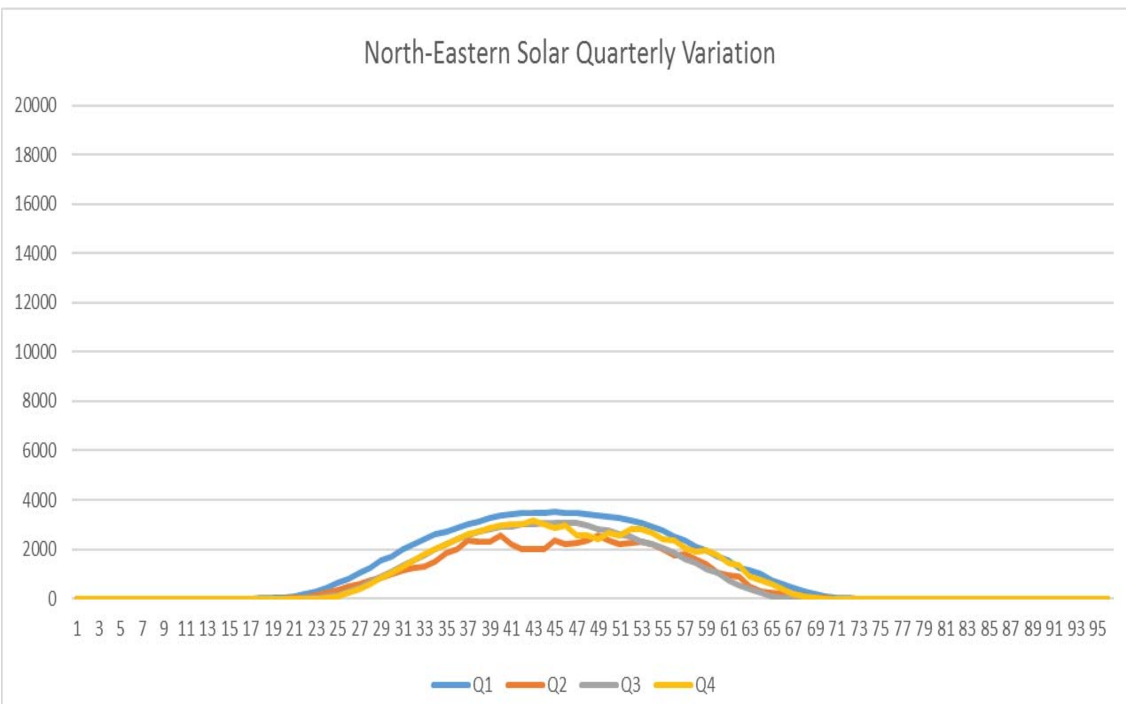
10.3.2 Solar Quarterly Variations:

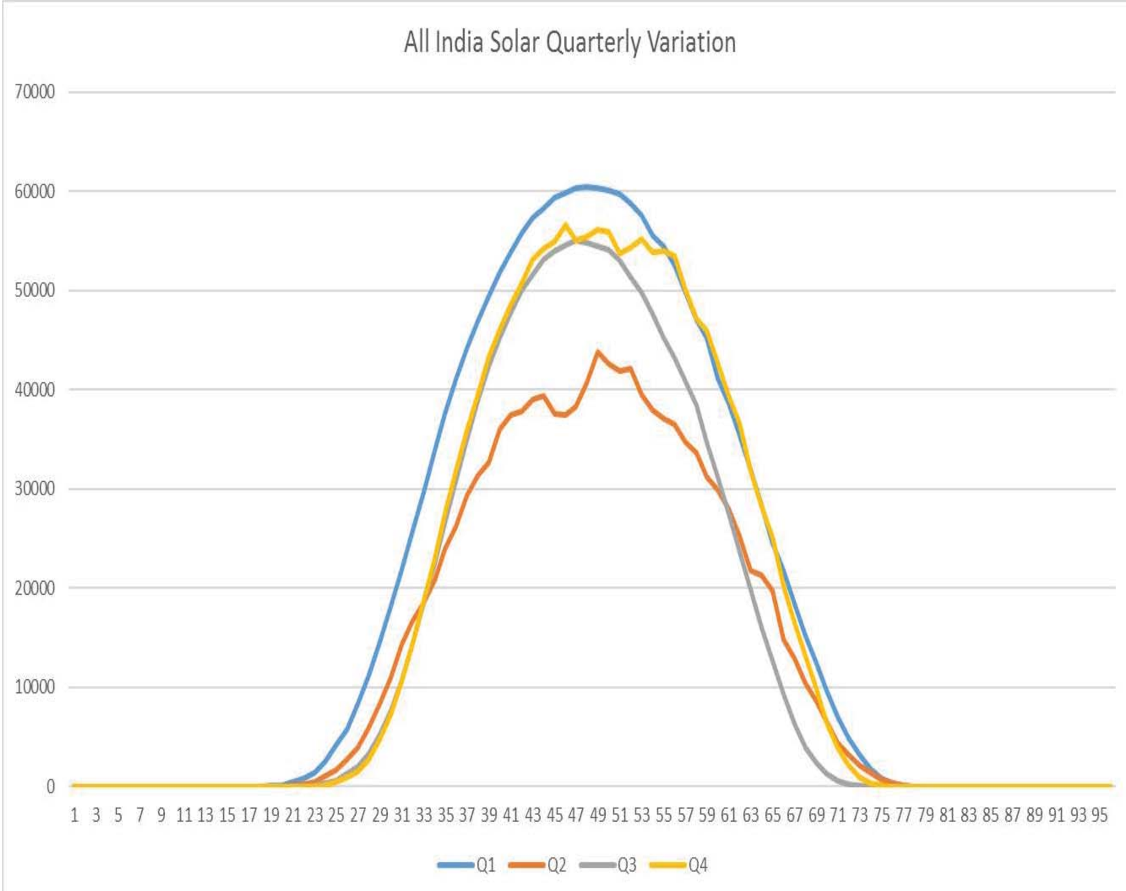



Western Solar Quarterly Variation
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Q1 Q2 Q3 Q4

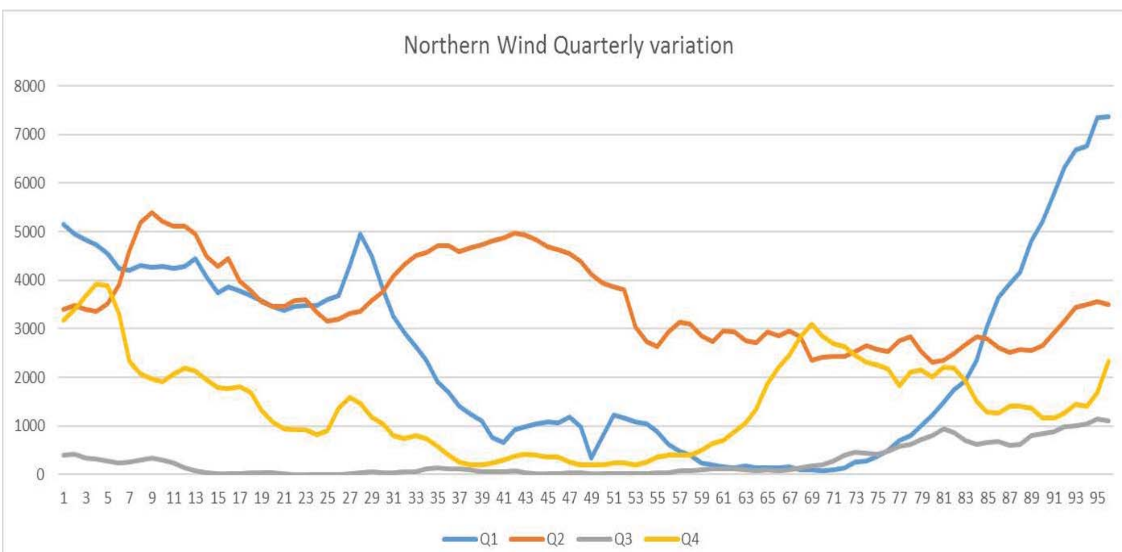

Southern Solar Quarterly Variation
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Q1 Q2 Q3 Q4

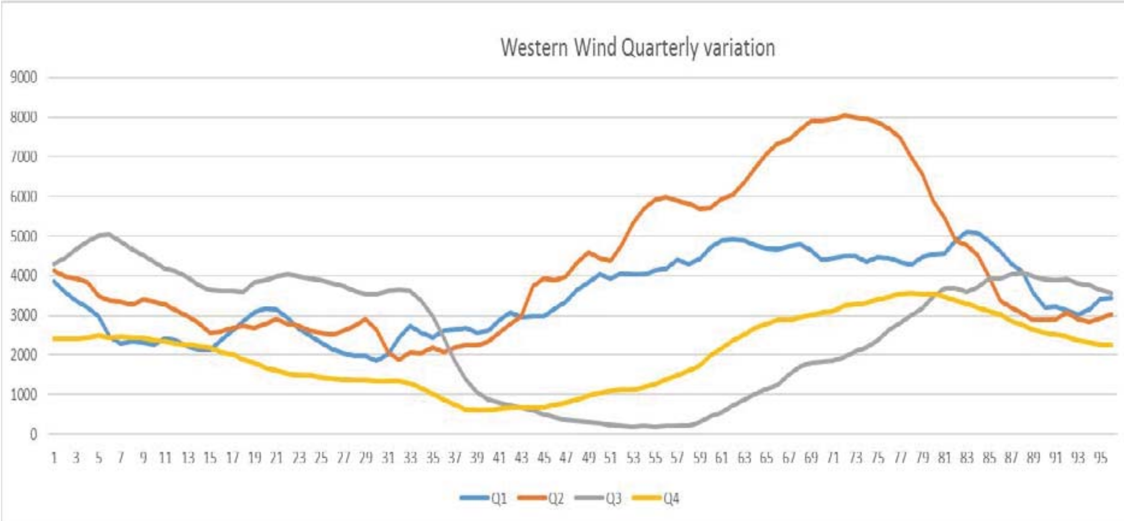

Eastern Solar Quarterly Variation
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Q1 Q2 Q3 Q4

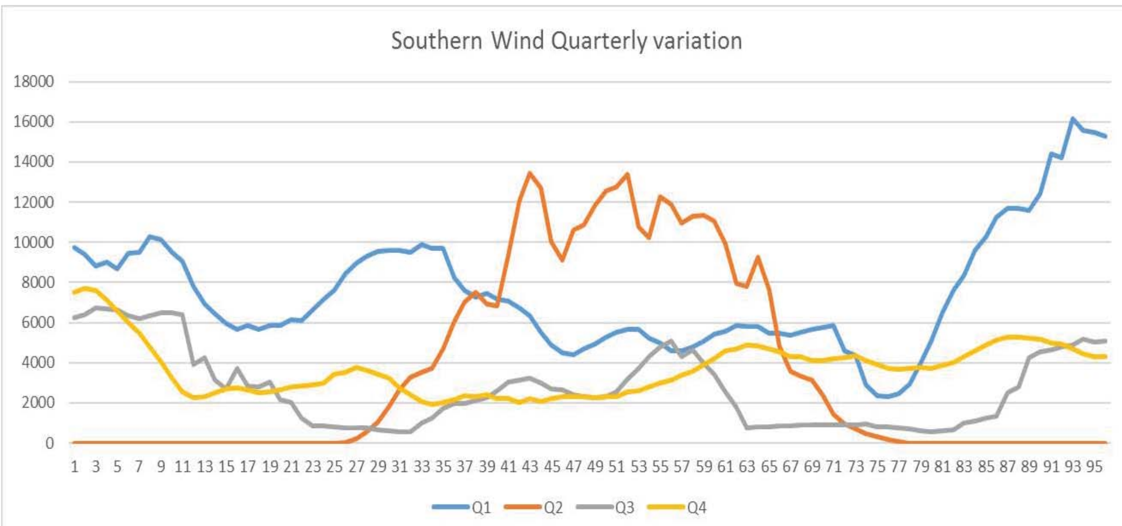

North-Eastern Solar Quarterly Variation
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Q1 Q2 Q3 Q4

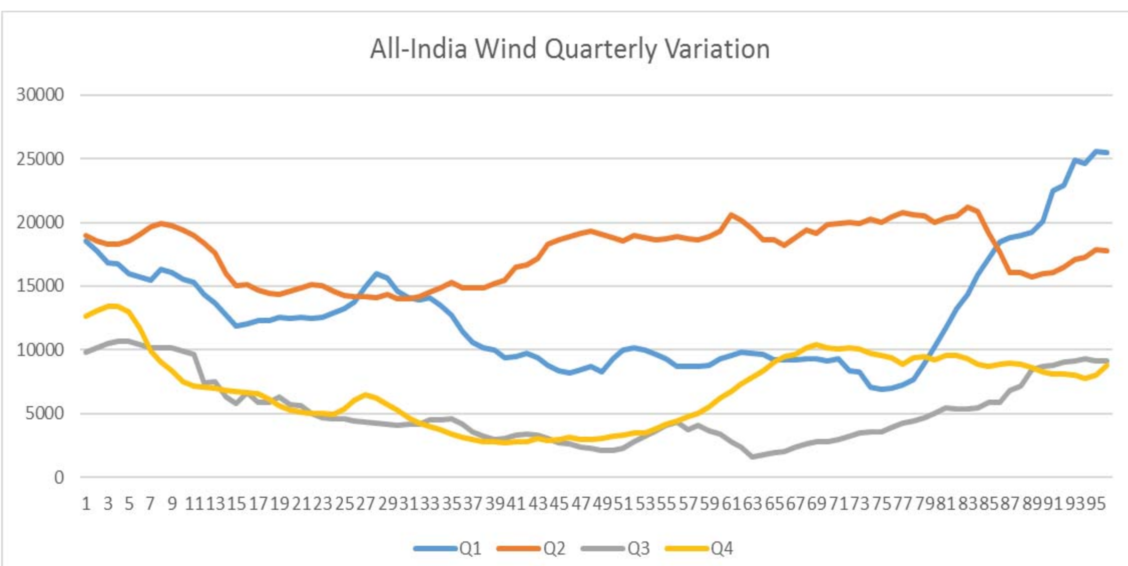


10.3.3 Wind Quarterly Variations:




Western Wind Quarterly variation
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Q1 Q2 Q3 Q4


Southern Wind Quarterly variation
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Q1 Q2 Q3 Q4

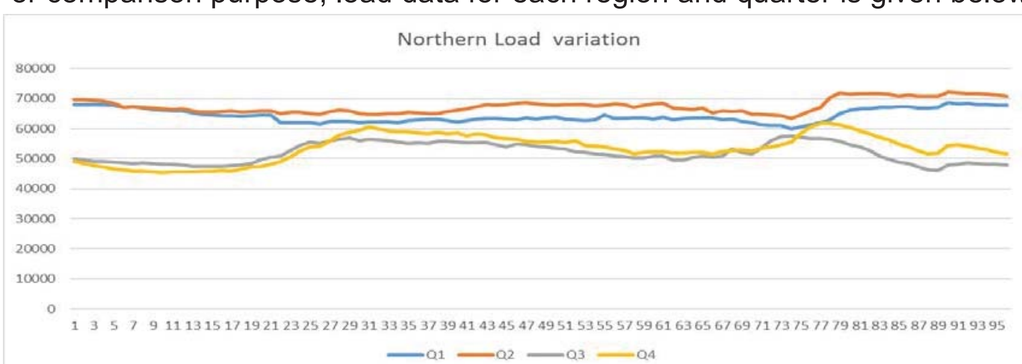

All-India Wind Quarterly Variation
30000
25000
20000
15000
10000
5000
0
1 3 5 7 9 111315171921232527293133353739414345474951535557596163656769717375777981838587899193 95
Q1 Q2 Q3 Q4

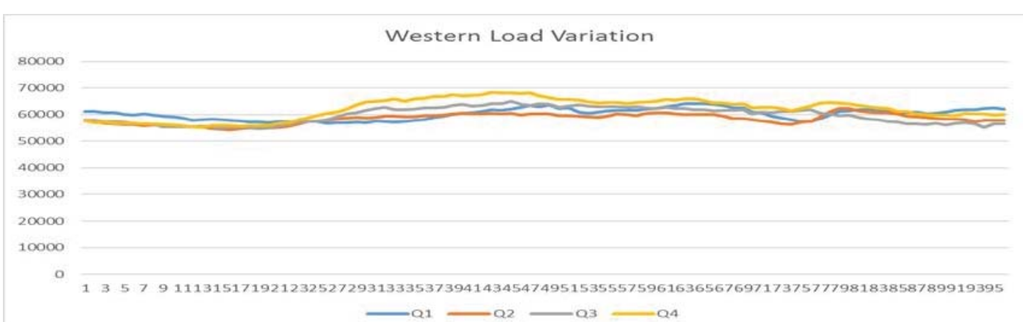
10.4 CORRELATION OF WIND & SOLAR WITH LOAD

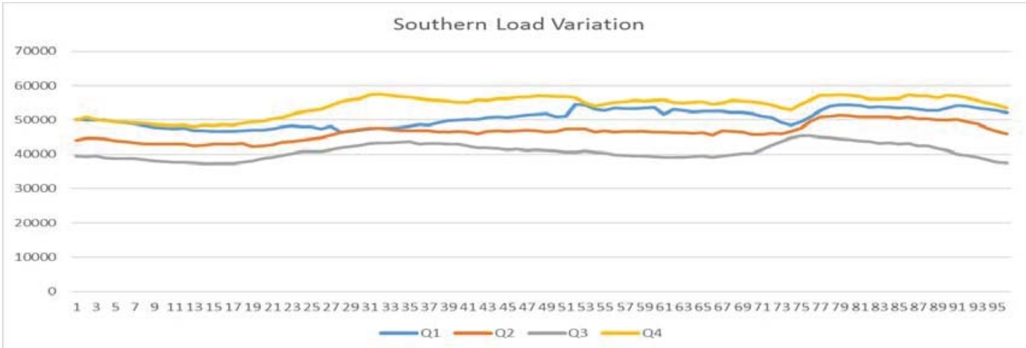
Sometime it is considered that wind and solar variation would coincide with the load variation and thus help each other. However, it is important that it should be verified. This section presents relationship, if any exists between wind & solar variation with variations in load, through quantitative analysis. In statistic a correlation function measures the strength of the relationship between two variables. Here with the help of collected data from various solar and wind plant, correlation between solar & load, wind & load and solar+ wind & load has been calculated. Following table shows the results of data analysis.

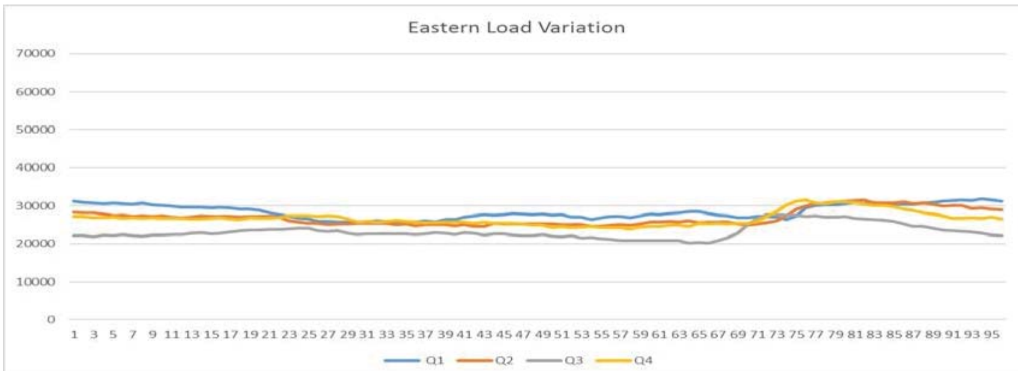
Region	Load & solar	Load & wind	Load & wind+solar
Northern	0.041	0.268	0.1004
Western	0.410	-0.260	0.200
Southern	0.150	-0.0030	0.112
Eastern	-0.369	No wind	-0.369
North-Eastern	-0.295	No wind	-0.295
All-India	0.017	0.438	0.1888

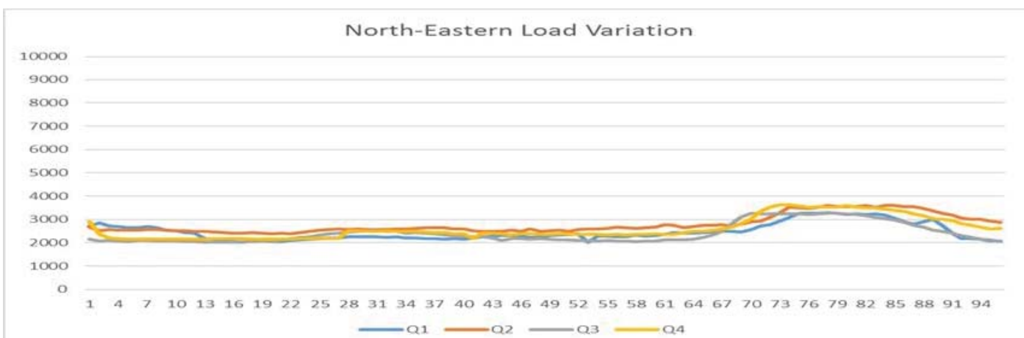
For comparison purpose, load data for each region and quarter is given below:

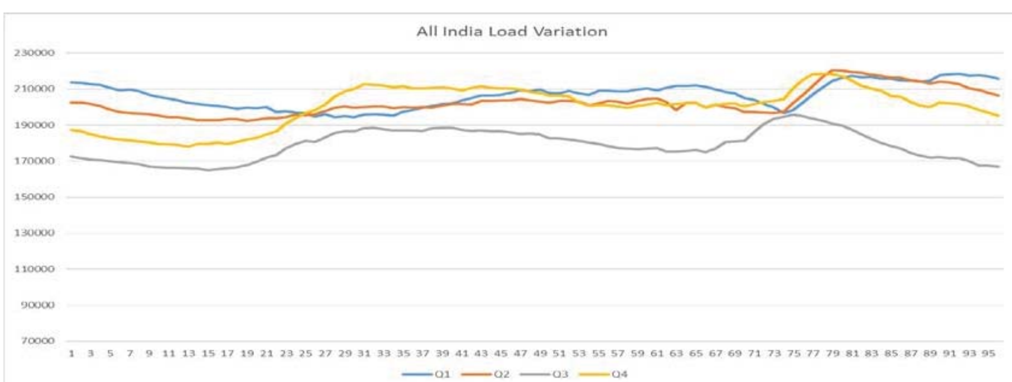










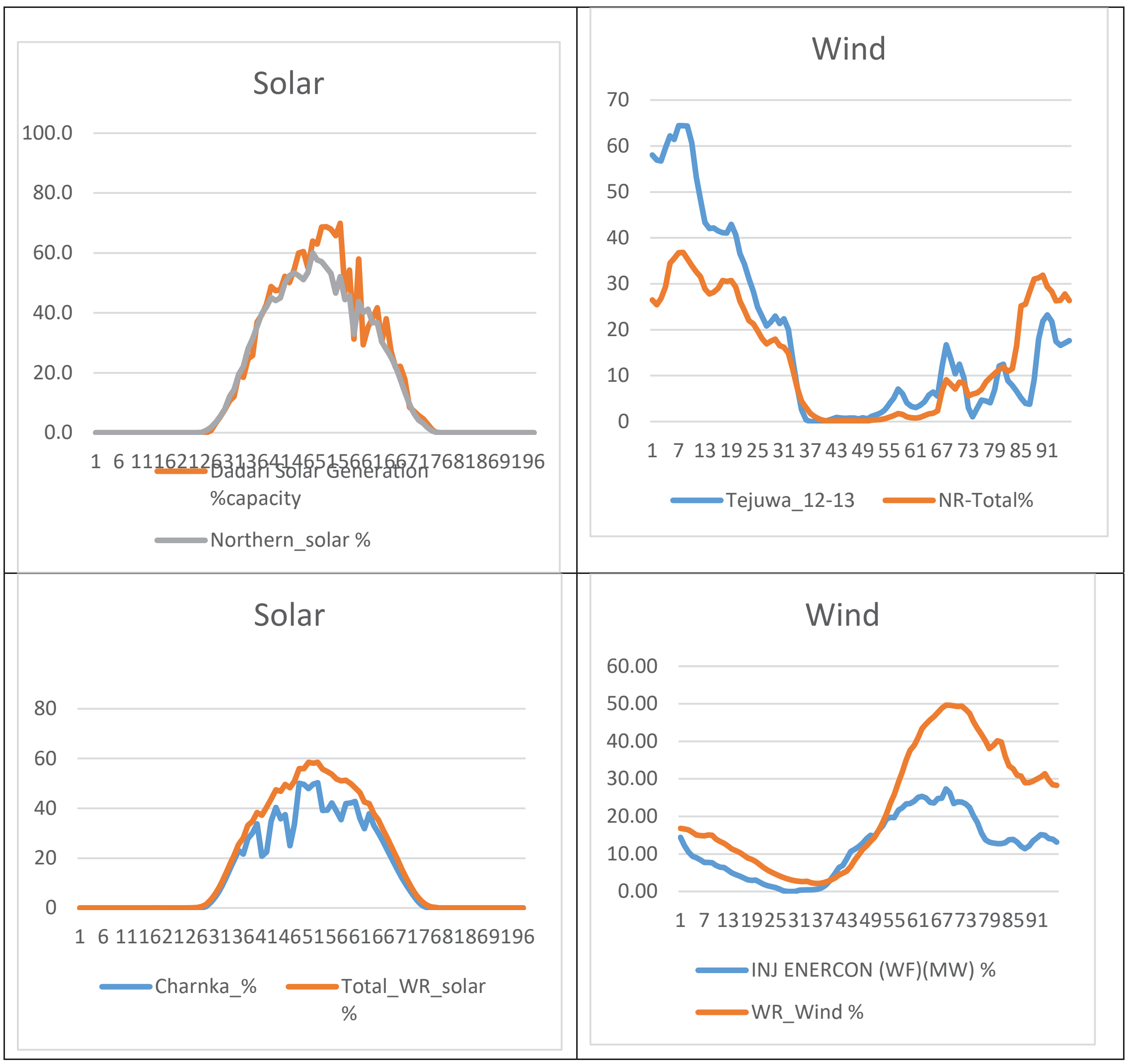


From the above, it is seen that there is some relationship between solar generation and load in Western Region (41 %) and between wind and load in

Northern region (26.8 %). However, on all-India basis, the relationship only about 18.8% between variations in the load with respect to variations in the combined wind and solar generation for 160 GW of installed capacity. These numbers are not static but would vary depending upon actual composition of RES by 2021-22. Therefore, it is important that the variations in RES generation should analysed independently also.

10.5 SMOOTHENING EFFECT OF DIVERSITY

As there would be large number of big and small RES generating stations, it is observed that the aggregate generation from RES in a state/or region contains lesser variations in terms of percentage of the total RES capacity installed in that state/region. Similarly, the percentage variations on all-India basis are likely to be still smoother. An example for solar and wind generation is given below:



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CHAPTER - 11

INTEGRATION OF RENEWABLE ENERGY WITH GRID: RE BALANCING

11.1 INTRODUCTION

As seen in the previous chapter, the wind and solar based RES generation are highly dependent on weather conditions. Though the dispatch from these generation sources varies every minute, for the purpose of grid balancing i.e. for maintaining frequency by keeping load-generation balance and also for the purpose of flows on transmission lines, it is very important that proper assessment of the variability of these generation sources is made. Though forecast of wind and solar based generations is being carried out nowadays with lesser estimation errors, these estimates still have to improve a lot. Even if we assume that the estimates are correct, still balancing actions would be needed because of natural intermittency of such generations.

The variability assessment is needed for periods of 1-minute to 24-hours and also for each day of the year as these generations also vary with time of day and seasons. We need to calculate the net demand that would be supplied by the conventional generation if all the renewable energy is to be utilized.

11.2 Region-wise Ramp up/down of wind and solar energy

11.2.1 Data for Wind and solar has been collected from various source and exercise has been carried out to calculate maximum ramp up/down for different time duration for each region.

11.2.2 The ramp-ups or ramp-downs in the RES generation depend on composition of RES i.e. the percentage of solar or wind capacity, regional specific factors and of course the season and time of day. Thus it is important that these variations are estimated for 15-minute to 6-hour for each region and separately for both wind as well as solar capacities. Detailed study has been carried out on the estimated RES generation data of 15-minute block, as explained in previous chapter for each region, and results of this study are being presented in this chapter for each region and also for all-India as a whole. However, for the purpose of explaining the methodology details of the exercise carried out for Western region are also being given here.

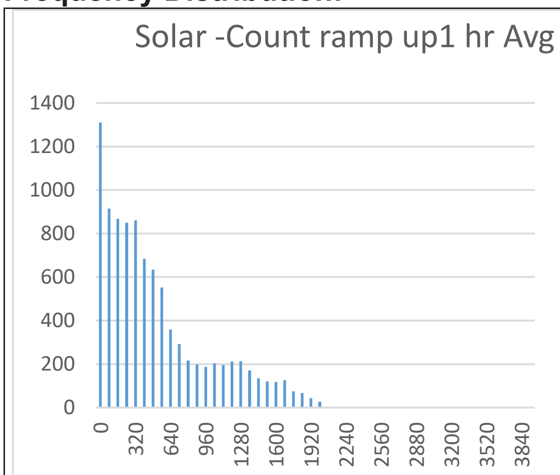
11.3 Variability of RES in Western Region

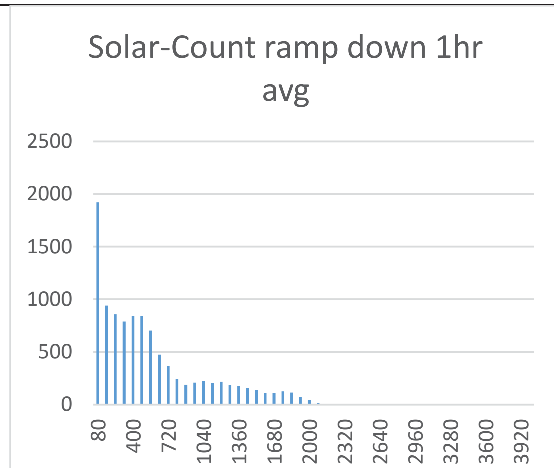
11.3.1 Variability of RES in 15-minutes with respect to 1-hour average are given as below:

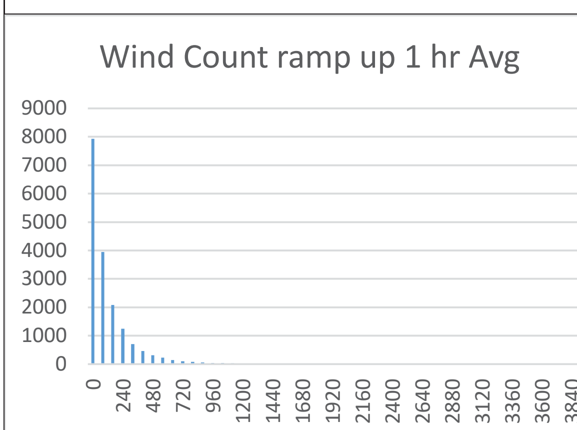
Results:

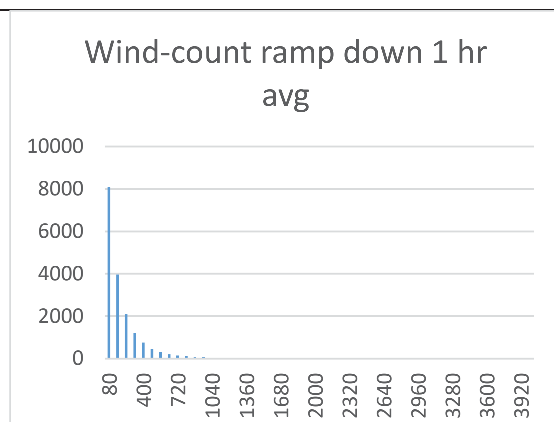
Diff w.r.t 1 hour avg data				
	Standard Deviation	**Maximum (Ramp up)**	**Minimum(Ramp Down)**	**Ramp up/down (98%)**
Solar	541	2174	-2155	1760/-1760
Wind	253	3201	-3084	720/-720
Solar+wind	574	3416	-3433	1600/-1600

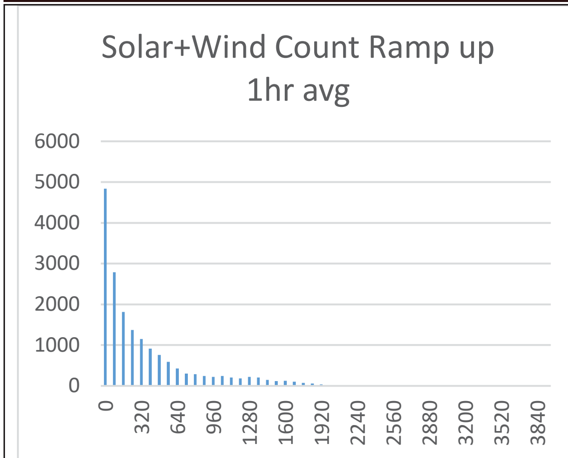
Frequency Distribution:

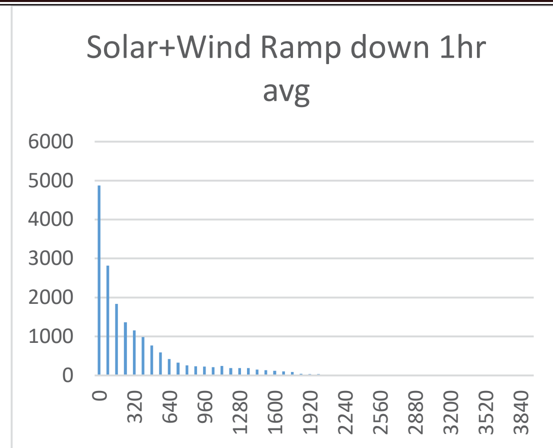


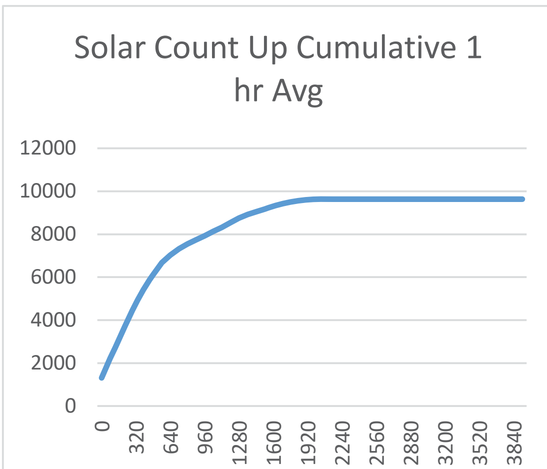


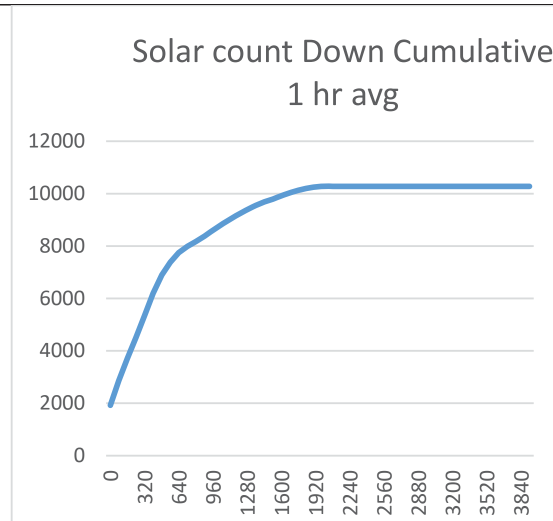


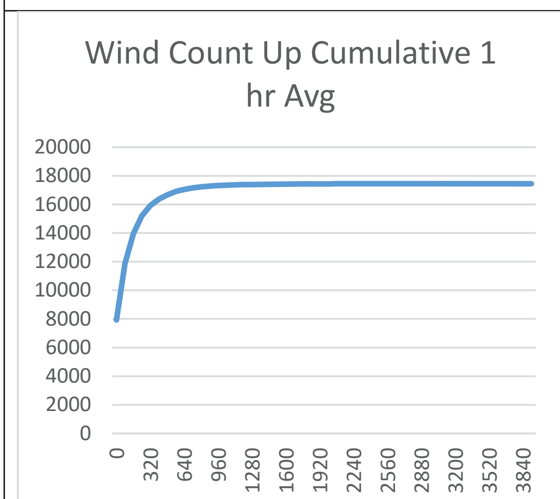


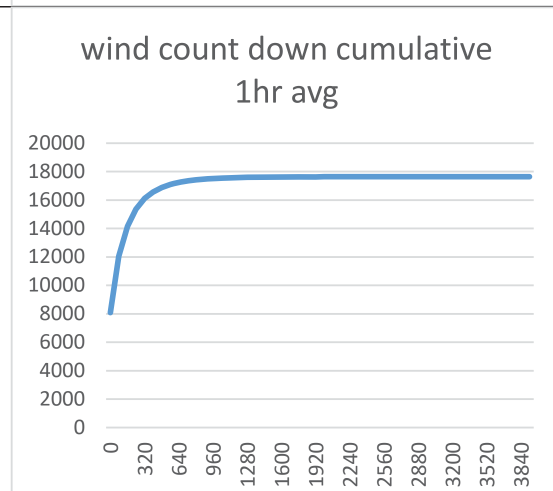

Solar+Wind Count Ramp up 1hr avg
6000
5000
4000
3000
2000
1000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840

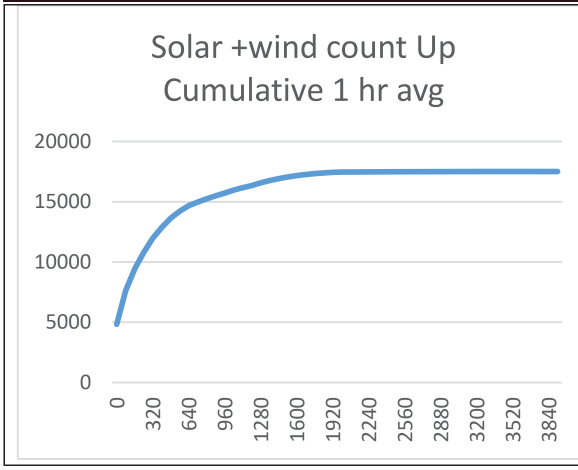

Solar+Wind Ramp down 1hr avg
6000
5000
4000
3000
2000
1000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840

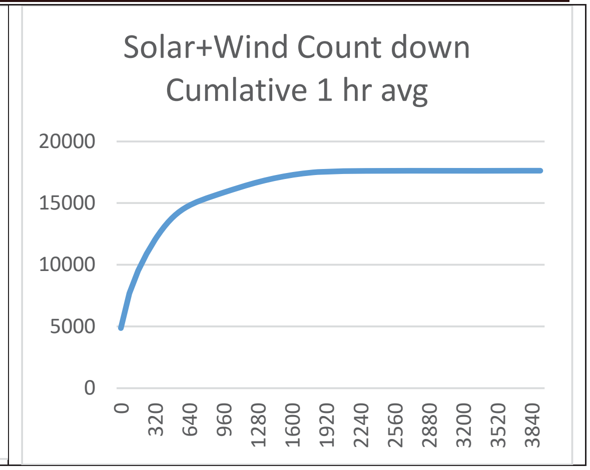

Solar Count Up Cumulative 1 hr Avg
12000
10000
8000
6000
4000
2000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840


Solar count Down Cumulative 1 hr avg
12000
10000
8000
6000
4000
2000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840


Wind Count Up Cumulative 1 hr Avg
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840


wind count down cumulative 1hr avg
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840



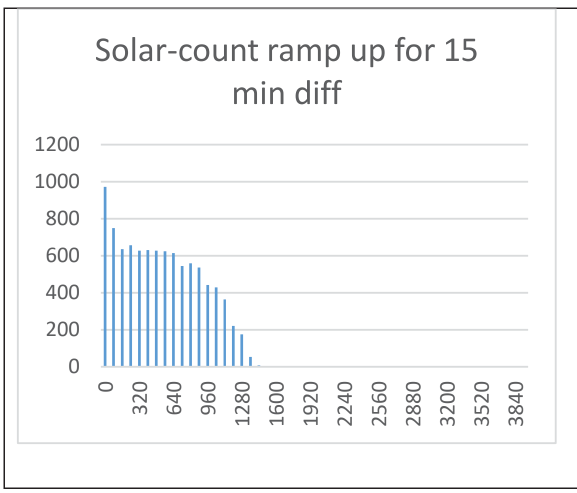


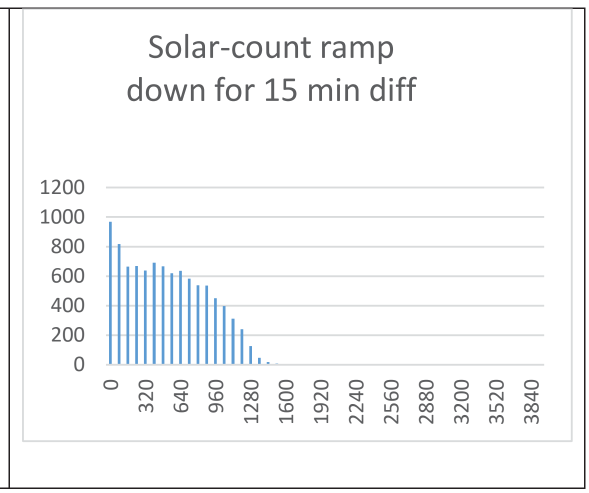
11.3.2 Variability of RES in 15-minutes duration is given as below:

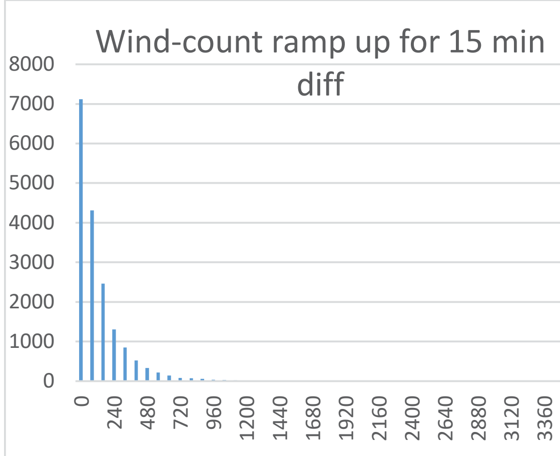
Results:

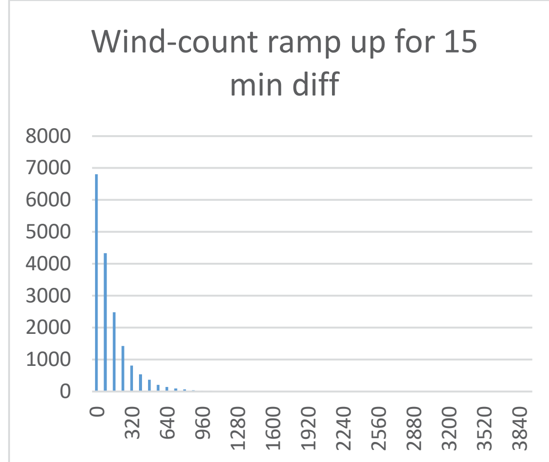
15 Min Diff				
	Standard Deviation	**Maximum (Ramp up)**	**Minimum(Ramp Down)**	**Ramp up/down(98%)**
Solar	495	1612	-1925	1280/-1280
Wind	253	3626	-3024	720/-640
Solar+Wind	536	3569	-2882	1280/-1280

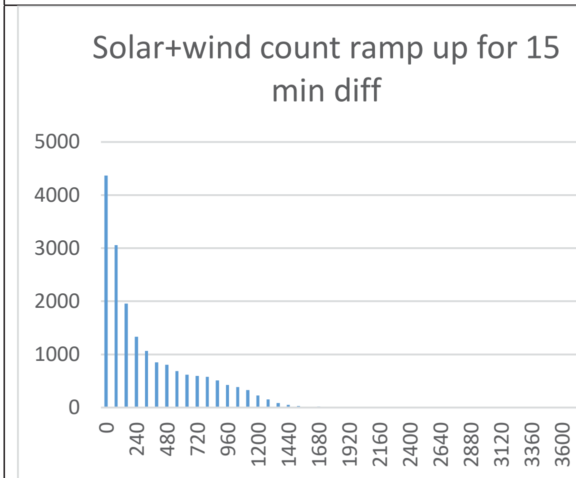
Frequency Distribution:

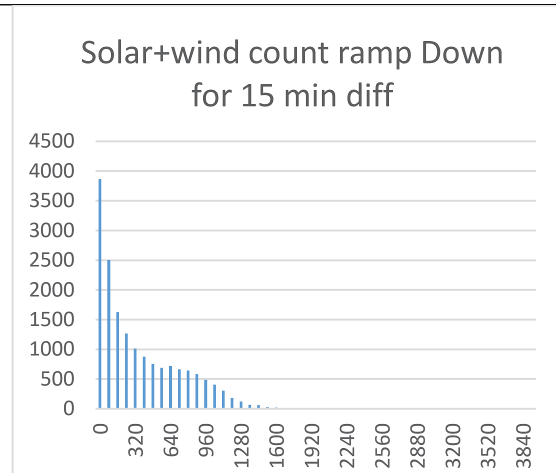


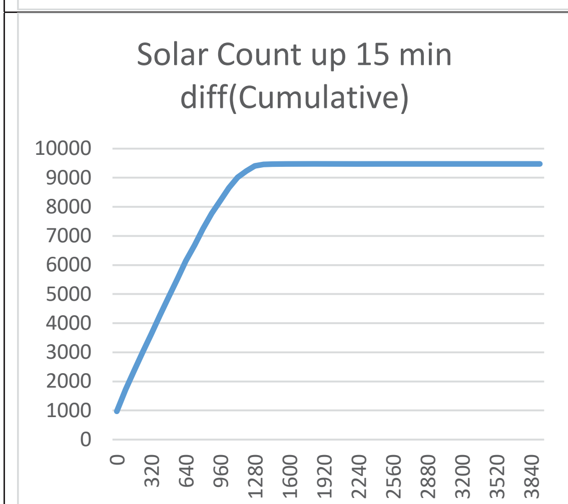


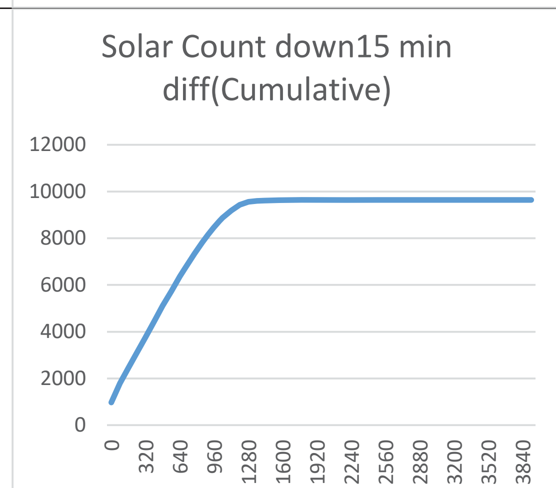

Wind-count ramp up for 15 min diff
8000
7000
6000
5000
4000
3000
2000
1000
0
0 240 480 720 960 1200 1440 1680 1920 2160 2400 2640 2880 3120 3360

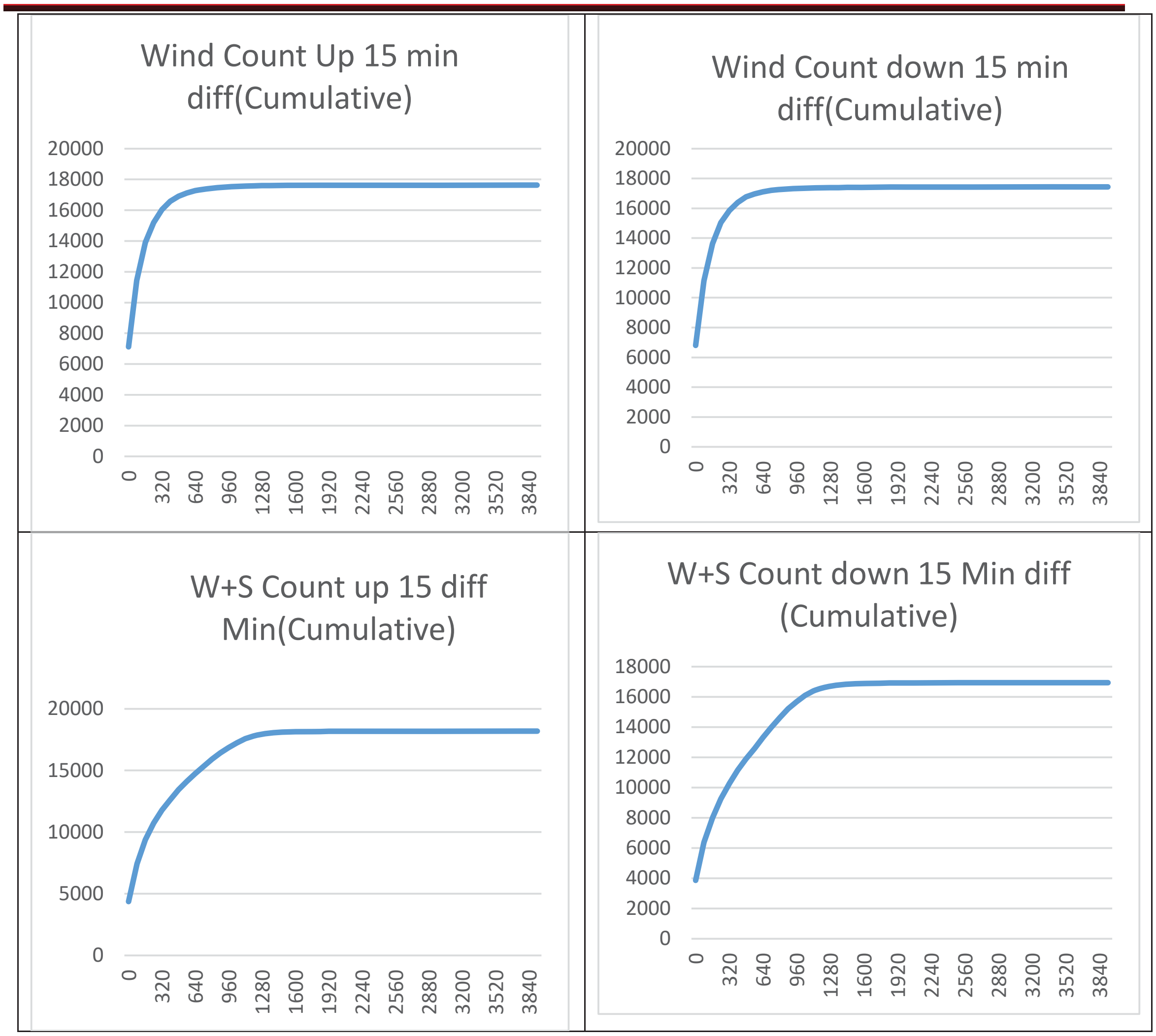

Wind-count ramp up for 15 min diff
8000
7000
6000
5000
4000
3000
2000
1000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840


Solar+wind count ramp up for 15 min diff
5000
4000
3000
2000
1000
0
0 240 480 720 960 1200 1440 1680 1920 2160 2400 2640 2880 3120 3360 3600


Solar+wind count ramp Down for 15 min diff
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840


Solar Count up 15 min diff(Cumulative)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840


Solar Count down15 min diff(Cumulative)
12000
10000
8000
6000
4000
2000
0
0 320 640 960 1280 1600 1920 2240 2560 2880 3200 3520 3840

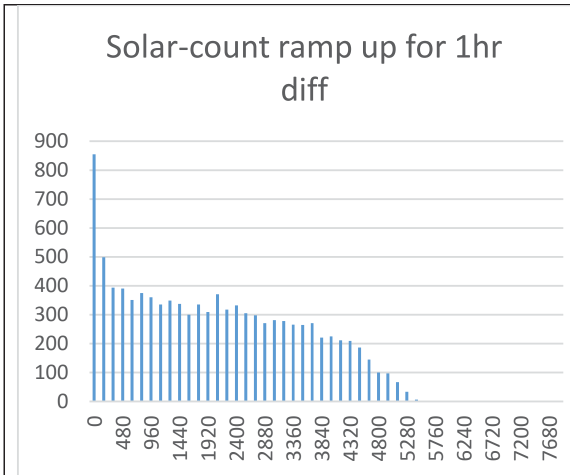


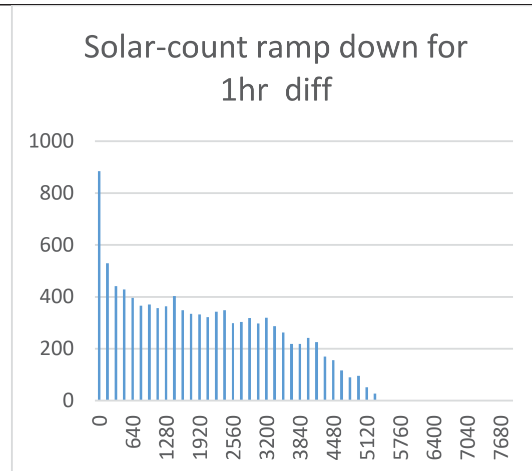
11.3.3 Variability of RES in one (1) hour duration is given as below:

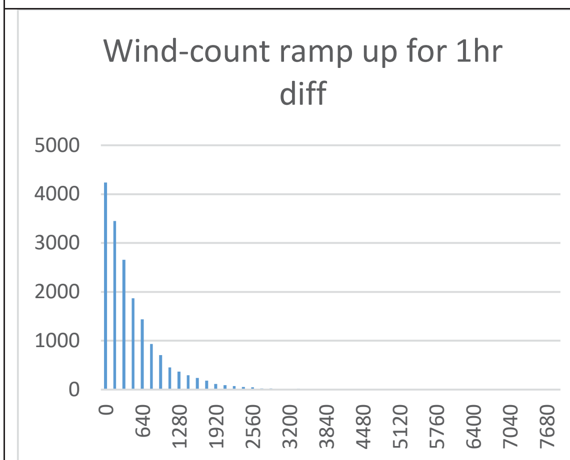
Results:

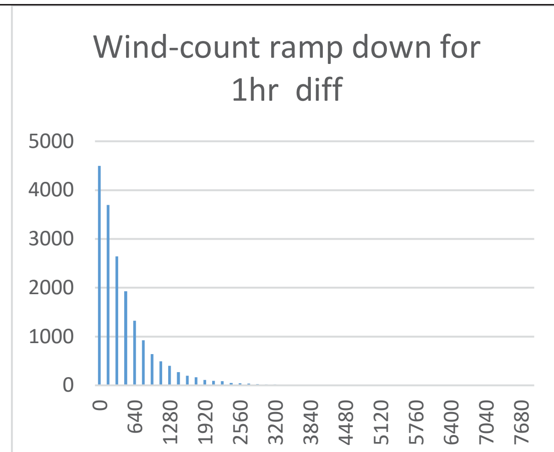
Long-duration Ramp-up/down (1 H)				
	Standard Deviation	**Maximum (Ramp up)**	**Minimum (Ramp Down)**	**Ramp Up/down**
Solar	1905	5572	-5491	4960/ -4800
Wind	778	5968	-5785	2080/ -2240
Solar+Wind	1976	8131	-7795	4640/ -4640

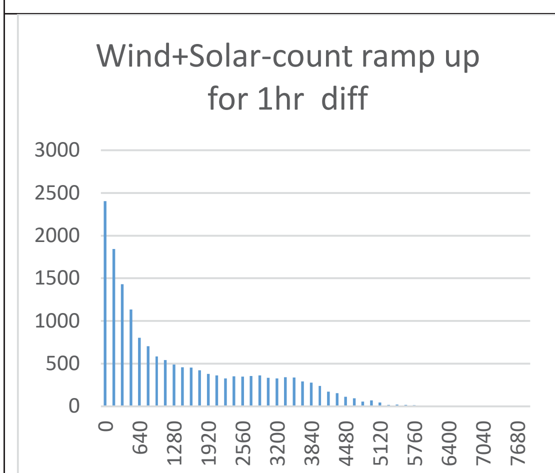
Frequency Distribution:

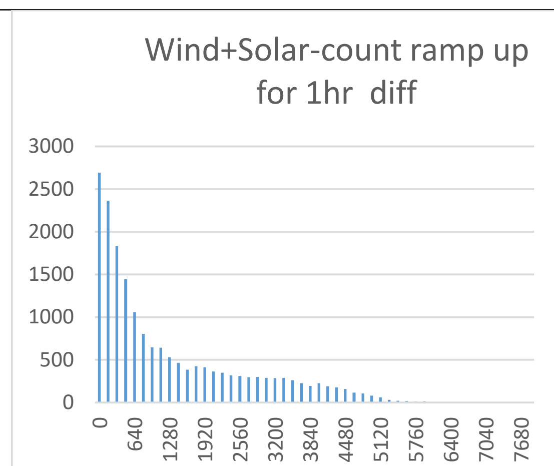


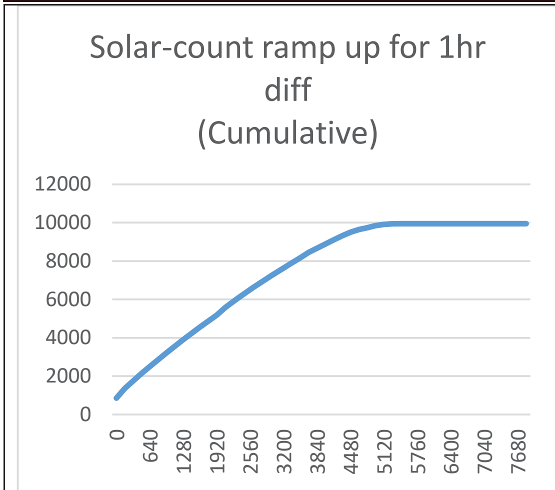


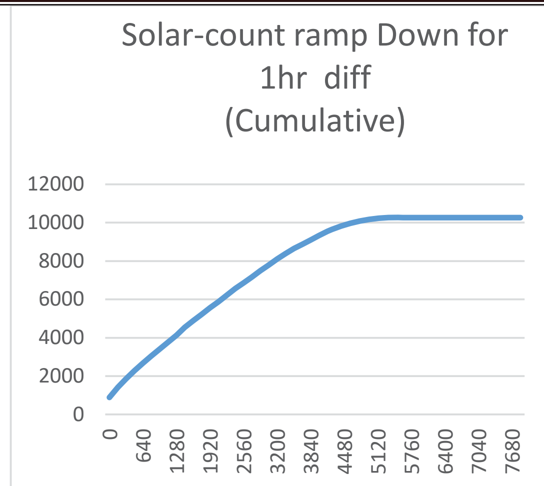


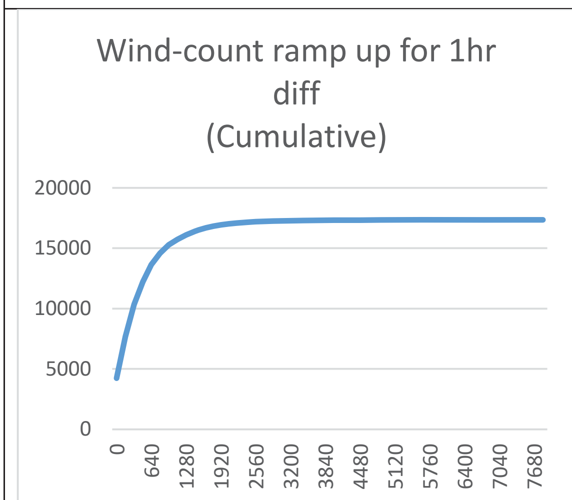


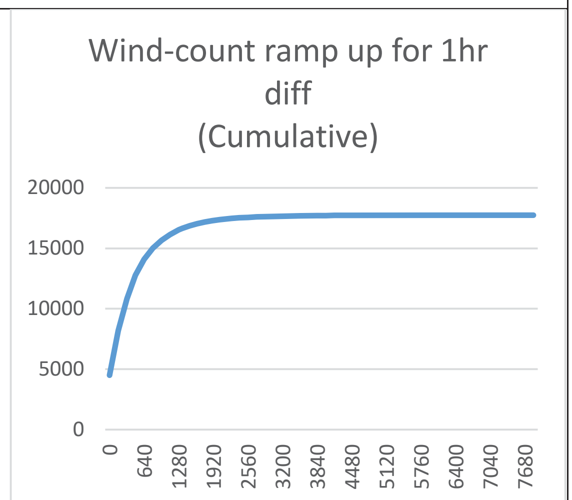


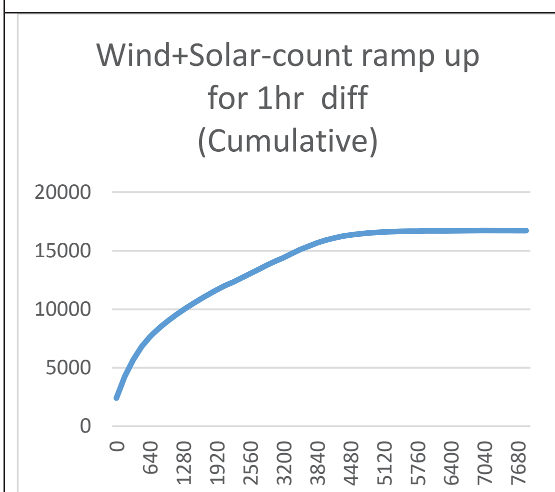


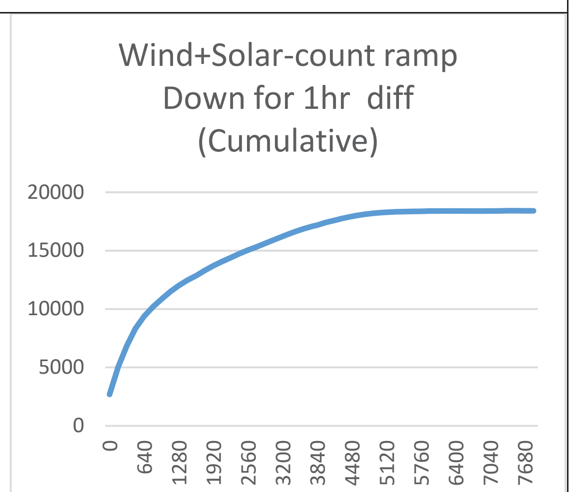

Solar-count ramp up for 1hr diff (Cumulative)
12000 10000 8000 6000 4000 2000 0
0 640 1280 1920 2560 3200 3840 4480 5120 5760 6400 7040 7680


Solar-count ramp Down for 1hr diff (Cumulative)
12000 10000 8000 6000 4000 2000 0
0 640 1280 1920 2560 3200 3840 4480 5120 5760 6400 7040 7680


Wind-count ramp up for 1hr diff (Cumulative)
20000 15000 10000 5000 0
0 640 1280 1920 2560 3200 3840 4480 5120 5760 6400 7040 7680


Wind-count ramp up for 1hr diff (Cumulative)
20000 15000 10000 5000 0
0 640 1280 1920 2560 3200 3840 4480 5120 5760 6400 7040 7680


Wind+Solar-count ramp up for 1hr diff (Cumulative)
20000 15000 10000 5000 0
0 640 1280 1920 2560 3200 3840 4480 5120 5760 6400 7040 7680

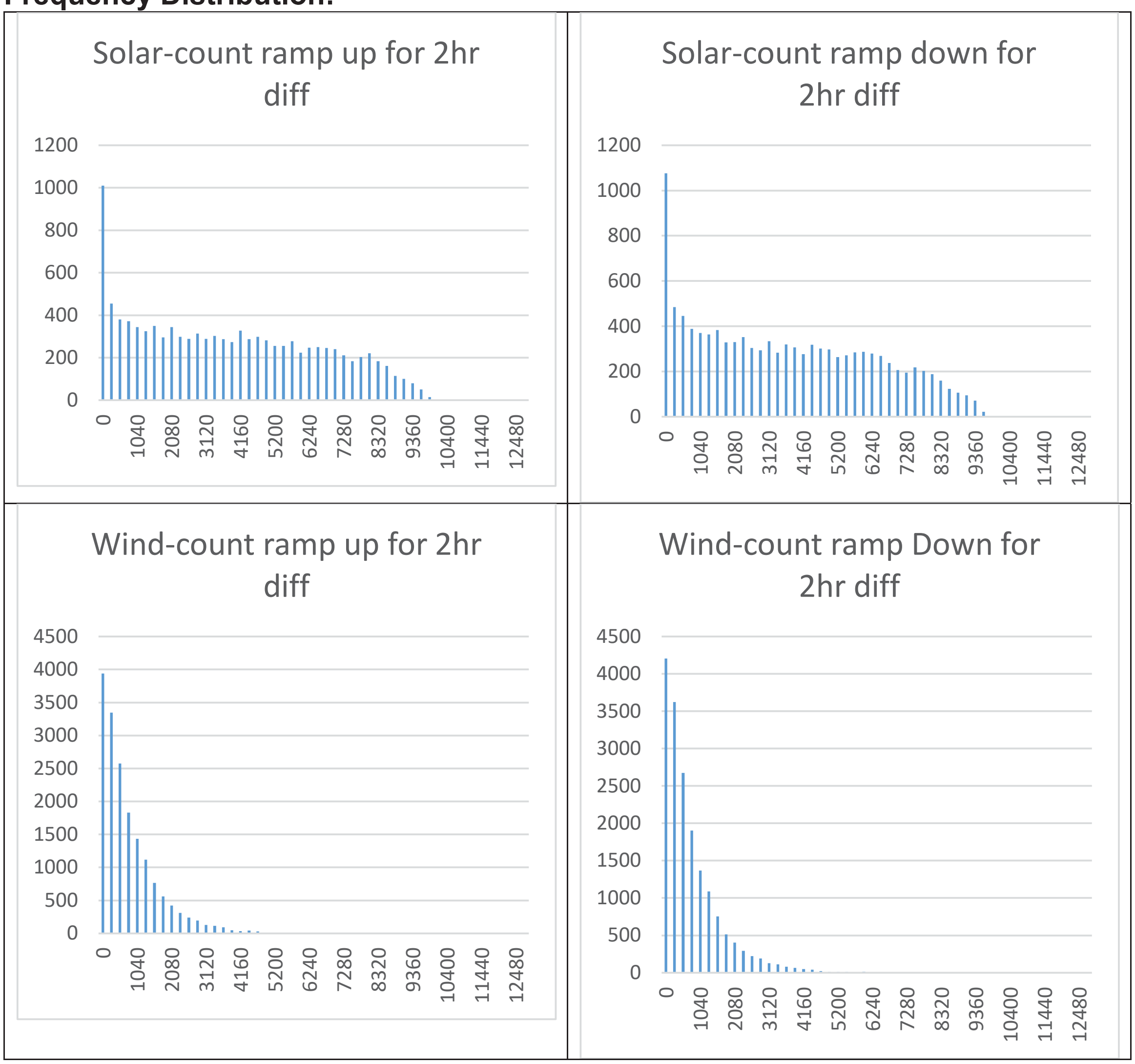

Wind+Solar-count ramp Down for 1hr diff (Cumulative)
20000 15000 10000 5000 0
0 640 1280 1920 2560 3200 3840 4480 5120 5760 6400 7040 7680

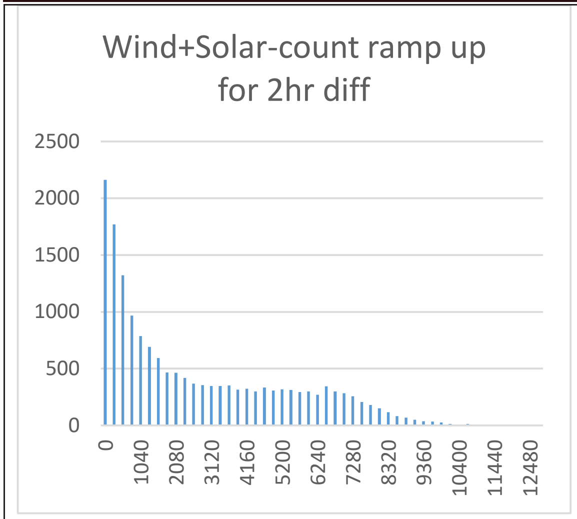
11.3.4 Variability of RES in two (2) hour duration is given as below:

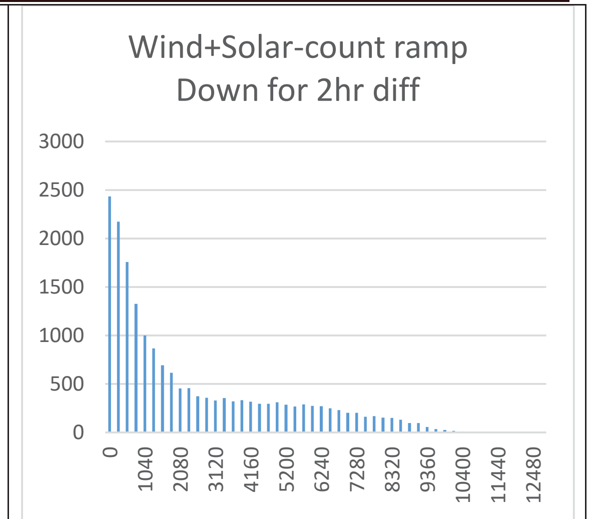
Results:

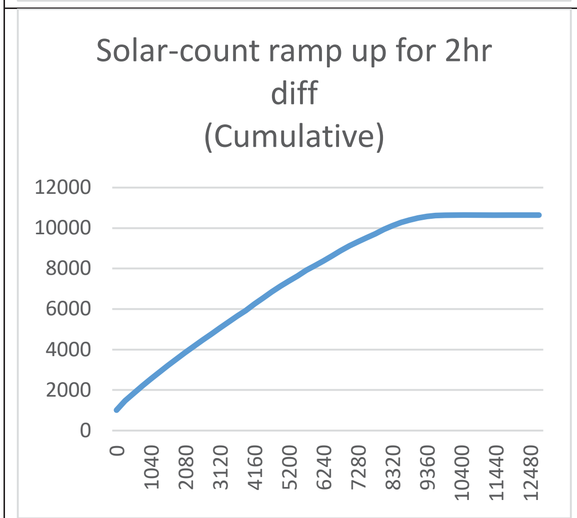
2 Hour Data Ahead Diff				
	Standard Deviation	**Maximum (Ramp up)**	**Minimum (Ramp Down)**	**Ramp Up/ down(98%)**
Solar	3657	10068	-9904	9100/ -8840
Wind	1277	7205	-7505	3380/ -3380
Solar+Wind		12934	-11955	8580/ -8580

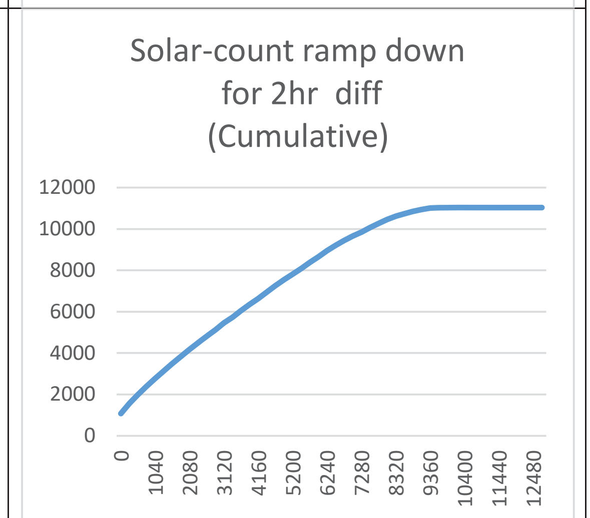
Frequency Distribution:

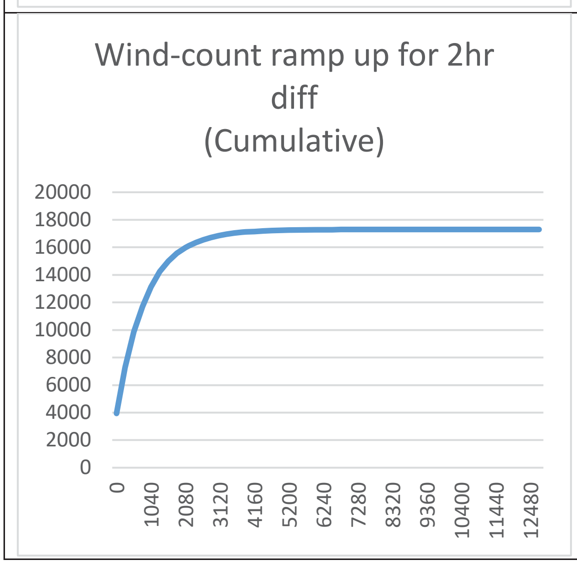


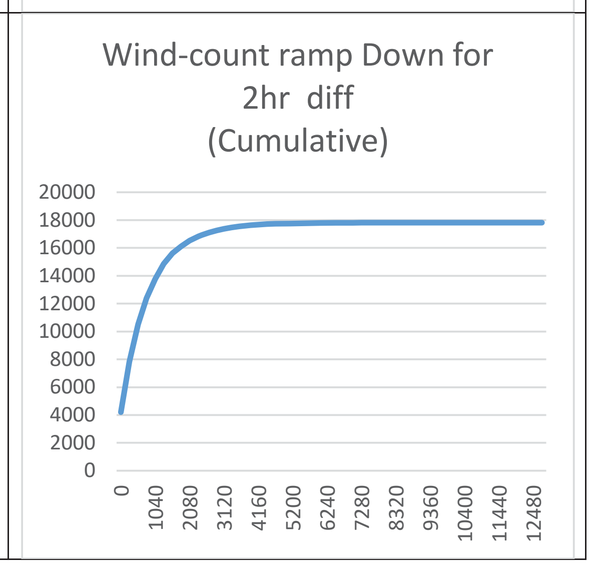

Wind+Solar-count ramp up for 2hr diff
2500
2000
1500
1000
500
0
0
1040
2080
3120
4160
5200
6240
7280
8320
9360
10400
11440
12480

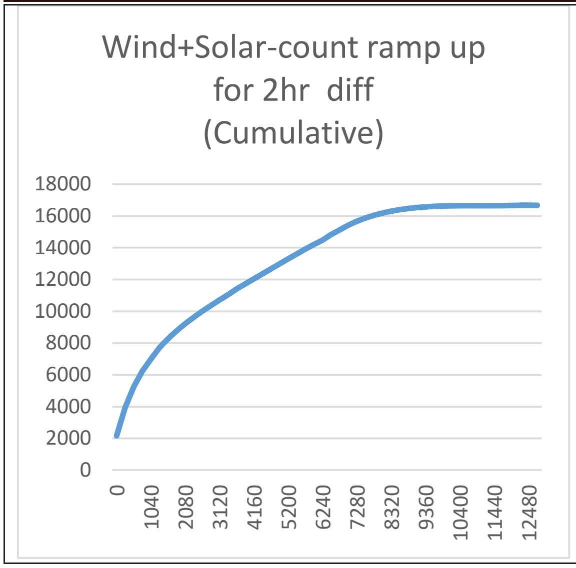

Wind+Solar-count ramp Down for 2hr diff
3000
2500
2000
1500
1000
500
0
0
1040
2080
3120
4160
5200
6240
7280
8320
9360
10400
11440
12480

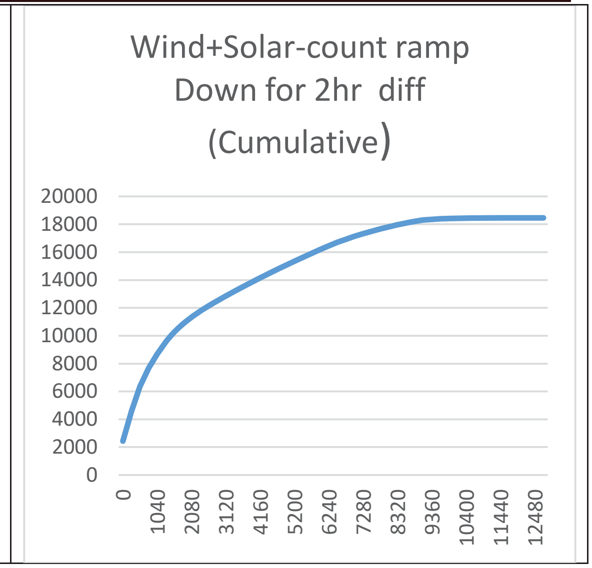

Solar-count ramp up for 2hr diff (Cumulative)
12000
10000
8000
6000
4000
2000
0
0
1040
2080
3120
4160
5200
6240
7280
8320
9360
10400
11440
12480


Solar-count ramp down for 2hr diff (Cumulative)
12000
10000
8000
6000
4000
2000
0
0
1040
2080
3120
4160
5200
6240
7280
8320
9360
10400
11440
12480


Wind-count ramp up for 2hr diff (Cumulative)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
1040
2080
3120
4160
5200
6240
7280
8320
9360
10400
11440
12480


Wind-count ramp Down for 2hr diff (Cumulative)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
1040
2080
3120
4160
5200
6240
7280
8320
9360
10400
11440
12480



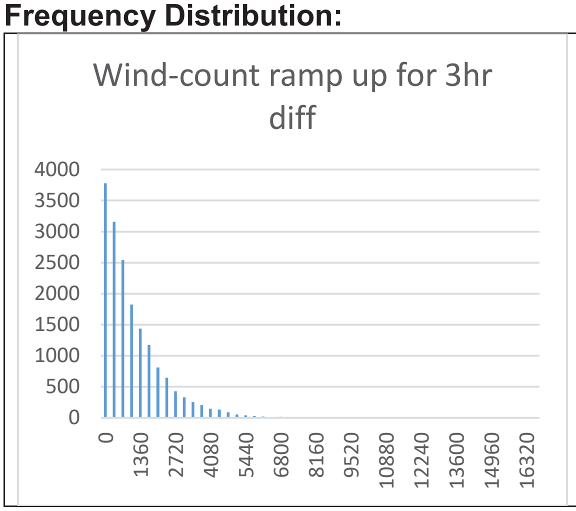


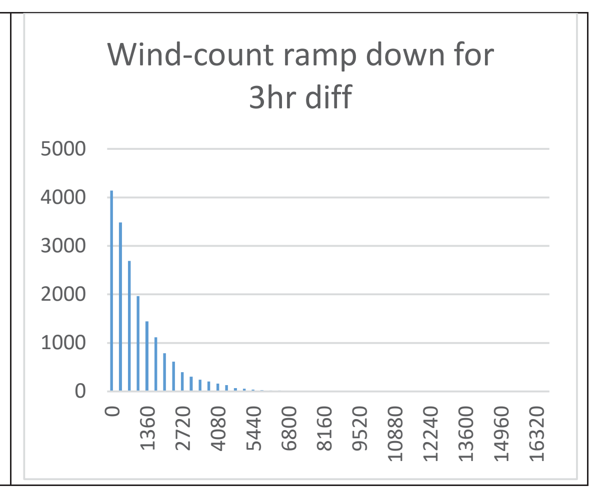
11.3.5 Variability of RES in three(3) hour is given as below:

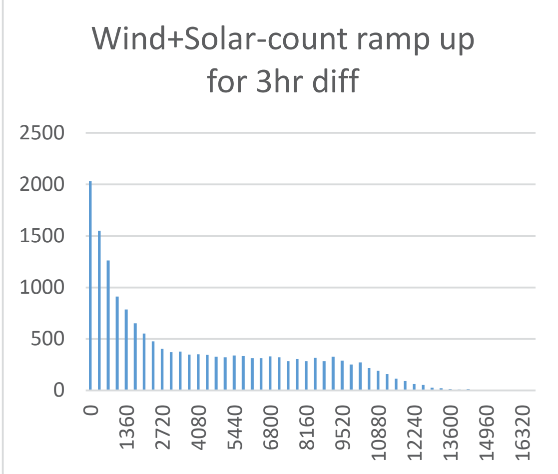
Results:

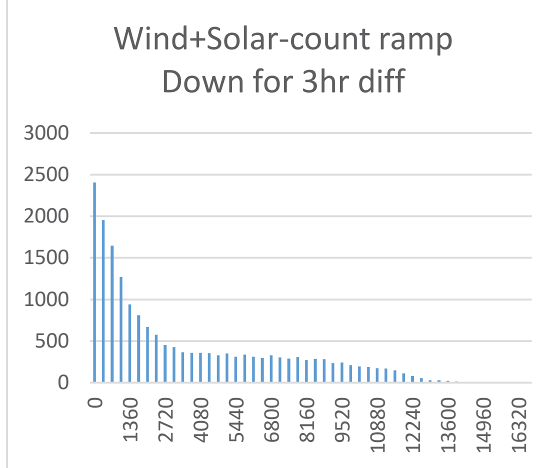
3 Hour Data Ahead Diff				
	Standard Deviation	Maximum (Ramp up)	Minimum (Ramp Down)	Ramp Up/ down(98%)
Solar	5203	13447	-13352	12240/ -11900
Wind	1665	8535	-8639	4420/ -4420
Solar+Wind	5244	16928	-15994	11560/ -11560

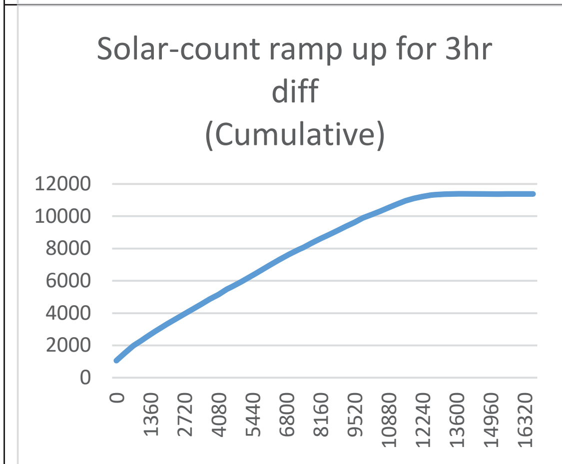
Frequency Distribution:

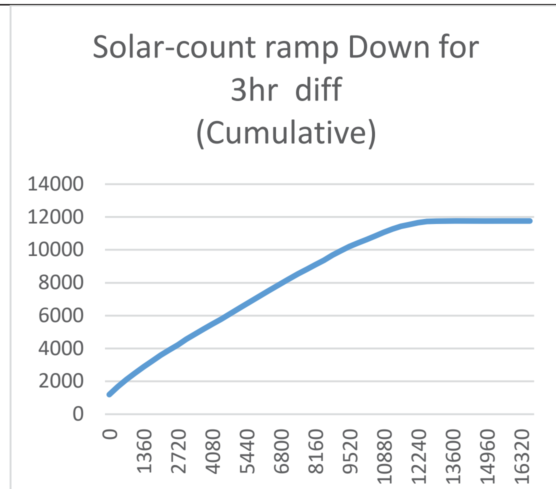


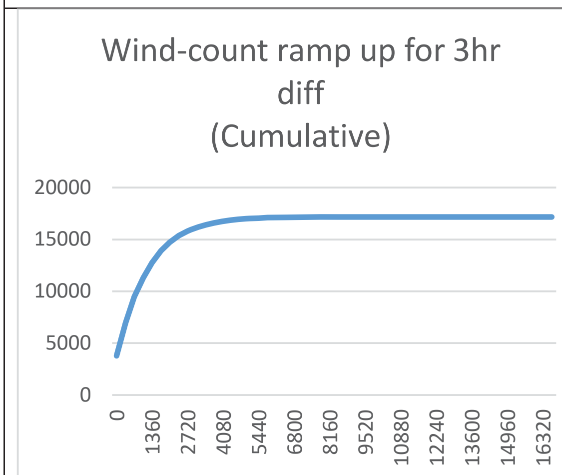


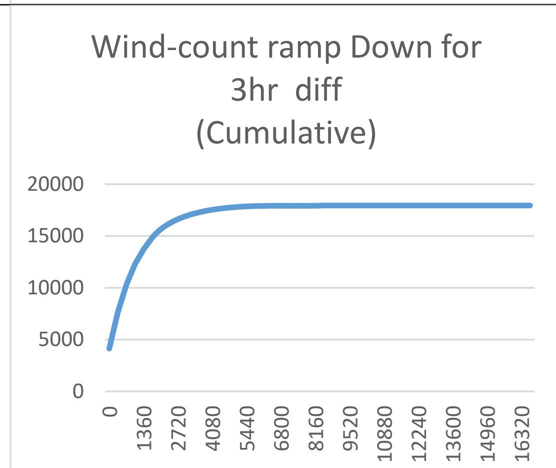

Wind+Solar-count ramp up for 3hr diff
2500
2000
1500
1000
500
0
0
1360
2720
4080
5440
6800
8160
9520
10880
12240
13600
14960
16320

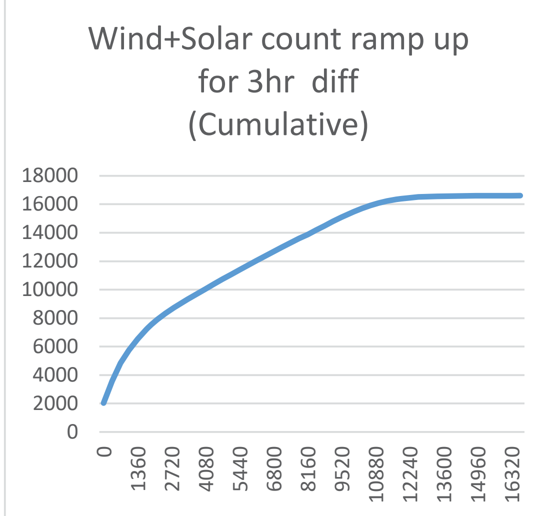

Wind+Solar-count ramp Down for 3hr diff
3000
2500
2000
1500
1000
500
0
0
1360
2720
4080
5440
6800
8160
9520
10880
12240
13600
14960
16320

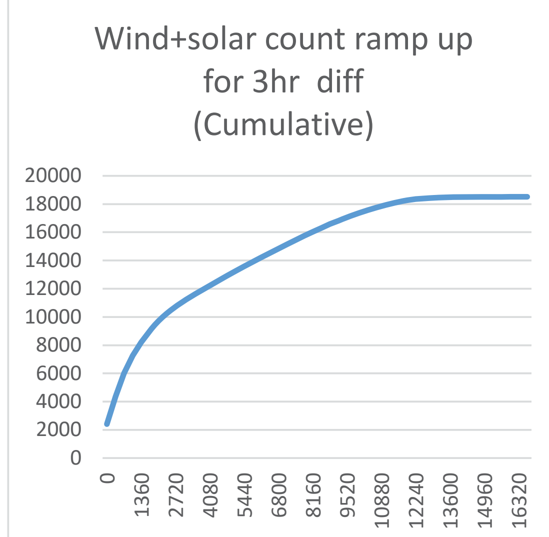

Solar-count ramp up for 3hr diff (Cumulative)
12000
10000
8000
6000
4000
2000
0
0
1360
2720
4080
5440
6800
8160
9520
10880
12240
13600
14960
16320


Solar-count ramp Down for 3hr diff (Cumulative)
14000
12000
10000
8000
6000
4000
2000
0
0
1360
2720
4080
5440
6800
8160
9520
10880
12240
13600
14960
16320


Wind-count ramp up for 3hr diff (Cumulative)
20000
15000
10000
5000
0
0
1360
2720
4080
5440
6800
8160
9520
10880
12240
13600
14960
16320


Wind-count ramp Down for 3hr diff (Cumulative)
20000
15000
10000
5000
0
0
1360
2720
4080
5440
6800
8160
9520
10880
12240
13600
14960
16320





11.3.6 Results of the study for Western region are given as below:

	Solar	Wind	solar +wind
Energy (BU)	36.6	38.8	75.5
peak (GW)	18.3	17.4	30.2
I/C (GW)	28.5	22.8	51.3
PLF (%)	18.25%	20.32%	19.17%
Correlation factor with Load	0.41	-0.26	0.20

Duration	Std deviation	Max Ramp Up	Max Ramp Down	98% Rmap Up/ Ramp down	MW/ hour Ramp Up/ Down	MW/ hour/IC (%)
15 min w.r.t. 1hour avg	574	3416	-3433	1600/ -1600	6400	12.5
15 Min	536	3568	-2882	1280/ -1280	5120	10.0
1 hour	1976	8130	-7794	4640/ -4640	4640	9.0
2 hour		12934	-11954	8580/ -8580	4290	8.4
3.hour	5244	16928	-15993	11560/ -11560	3853	7.5

11.4 Variability of RES in Northern Region

Variability of RES in NR for 15-minutes to 3-hour duration are given as below:

	Solar	Wind	solar +wind
Energy (BU)	37.32	10.26	47.58
peak (GW)	20.03	6.9	22.4
I/C (GW)	31.3	8.7	40
PLF (%)	16.93%	14.09%	15.84%
Correlation factor with Load	0.041	0.268	0.1004

Results (Northern Region Wind +solar):

Duration	Std deviation	Max Ramp Up	Max Ramp Down	98% Ramp Up/ Ramp down	MW/hour Ramp Up/ down	MW/ hour/IC (%)
15 min w.r.t. 1hour avg	628	5445	-5302	1820/-1820	7280	18.2
15 Min	627	4590	-5454	1680/ -1560	6720	16.8
1 hour	2098	11165	-11938	4800/ -5040	5040	12.6
2 hour	3882	14622	-12420	9000/ -9000	4500	11.3
3.hour	5453	14923	-15112	12160/ -12480	4160	10.4

11.5 Variability of RES in Southern Region

Variability of RES in SR for 15-minutes to 3-hour duration are given as below:

	Solar	Wind	solar +wind
Energy (BU)	34.08	52.47	86.55
peak (GW)	17.89	23.01	35.97
I/C (GW)	26.7	28.5	55.2
PLF (%)	18.13%	21.98%	20.87%
Correlation factor with Load	0.15	-0.003	0.112

Results (Southern Region Wind +solar):

Duration	Std deviation	Max Ramp Up	Max Ramp Down	98% Ramp Up/ Ramp down	MW/ hour Ramp Up/ Down	MW/ hour/IC (%)
15 min w.r.t. 1hour avg	799	4914	-5811	2280/ -2160	8640	16.5
15 Min	817	6023	-5593	2100/ -2100	8400	15.2
1 hour	2561	10938	-13207	6300/ -6000	6000	11.4
2 hour	4340	16731	-15442	10440/ -9360	5220	9.5
3.hour	5839	20560	-18601	14080/ -12320	4693	8.5

11.6 Variability of RES in Eastern Region

Variability of RES(ER has only solar, there is no wind) in ER for 15-minutes to 3-hour duration are given as below:

Solar	
Energy (BU)	15.8
peak (GW)	9.4
I/C (GW)	12.3
PLF (%)	18.29
Correlation factor with Load	-0.369

Results (Eastern Region Solar):

Duration	Std deviation	Max Ramp Up	Max Ramp Down	98% Ramp Up/ Ramp down	MW/ hour Ramp Up/ Down	MW/ hour/ IC (%)
15 min w.r.t. 1hour avg	282	1756	-1567	644/ -644	2576	20.9
15 Min	293	2488	-2744	600/ -680	2720	22.1
1 hour	931	3571	-4218	1680/ -1820	1820	14.8
2 hour	1723	5854	-6035	3000/ -3000	1500	12.2
3.hour	2412	7416	-7372	4080/ -3960	1360	11.1

11.7 Variability of RES in North-eastern Region

Variability of RES (NER has only solar, there is no wind) in NER for 15-minutes to 3-hour duration are given as below:

Solar	
Energy (BU)	15.52
peak (GW)	0.91
I/C (GW)	1.2
PLF (%)	18.37
Correlation factor with Load	-0.295

Results (Northern-eastern Region solar):

	Std deviation	Max Ramp Up	Max Ramp Down	98% Ramp Up/ Ramp down	MW/ hour Ramp Up/ Down	MW/ hour/ IC (%)
15 min w.r.t. 1hour avg	28.6	207	-213	96/-90	360	23.0
15 Min	29.9	323	-272	88/ -104	416	17.4
1 hour	93.6	358	-463	242/ -264	264	16.5
2 hour	171.8	563	-648	432/ -432	216	15.2
3.hour	239.3	722	-718	576/ -560	192	13.9

11.8 Variability of RES on All-India basis

Variability of RES on all-India basis for 15-minutes to 3-hour duration are given as below:

	Solar	Wind	solar +wind
Energy (BU)	156.50	106.51	263.01
peak (GW)	66.1	38.39	91.51
I/C (GW)	100	60	160
PLF (%)	17.86	20.26	18.76
Correlation factor with Load	0.017	0.438	0.1888

Results (All-India, Wind +solar):

Duration	Std deviation	Max Ramp Up	Max Ramp Down	98% Ramp Up/ Ramp down	MW/ hour Ramp Up/ Down	MW/ hour/ IC (%)
15 min w.r.t. 1hour avg	1898.3	8139	-8714	5400/ -5400	21600	13.5
15 Min	1773.7	6921	-6433	4060/ -4200	16800	10.5
1 hour	6595.8	22182	-20462	15500/ -14500	15500	9.7
2 hour	12538.5	38069	-36722	28800/ -27200	14400	9.0
3 hour	17776.7	50331	-48554	39600/ -37400	13200	8.3

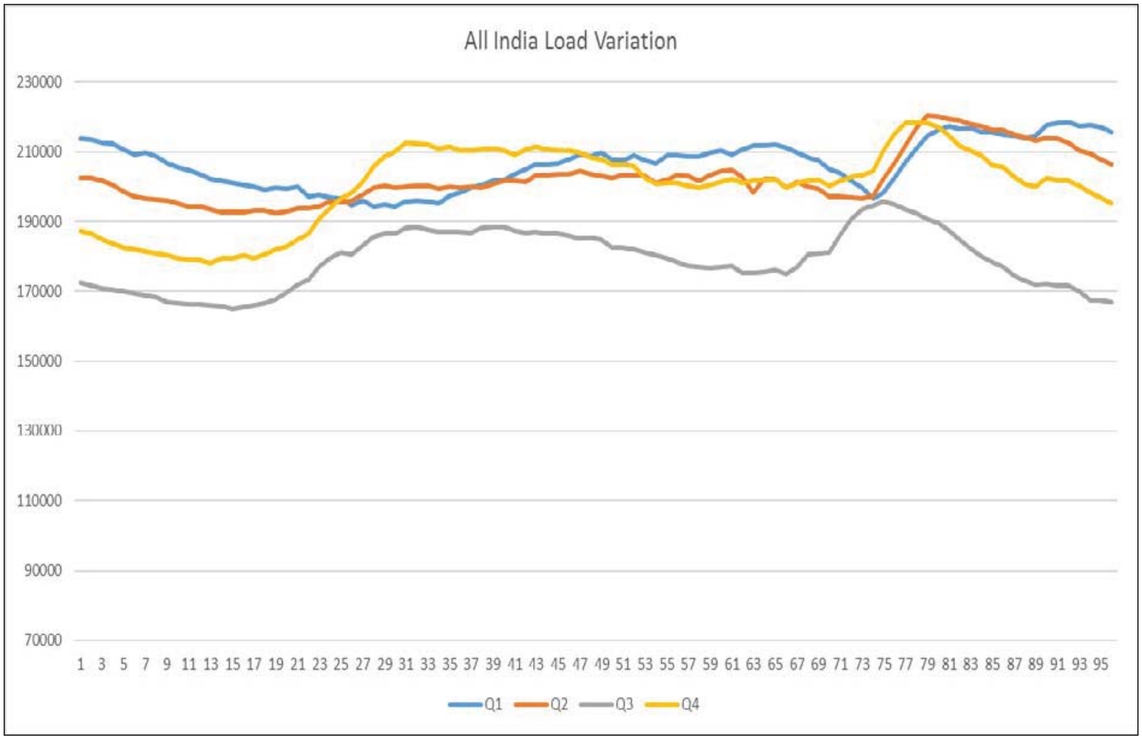
11.9 Assessment of Balancing capacity needed for period up to 2021-22

11.9.1 During ramp up / ramp down of RES and the demand there will be a need to increase or decrease the thermal generation corresponding to net demand, as required to be met from thermal generation. Here, it is assumed that the hydro plants would be operated as usual for meeting the morning and evening peak requirements, and thus, the onus of balancing would be on gas and coal based plants.

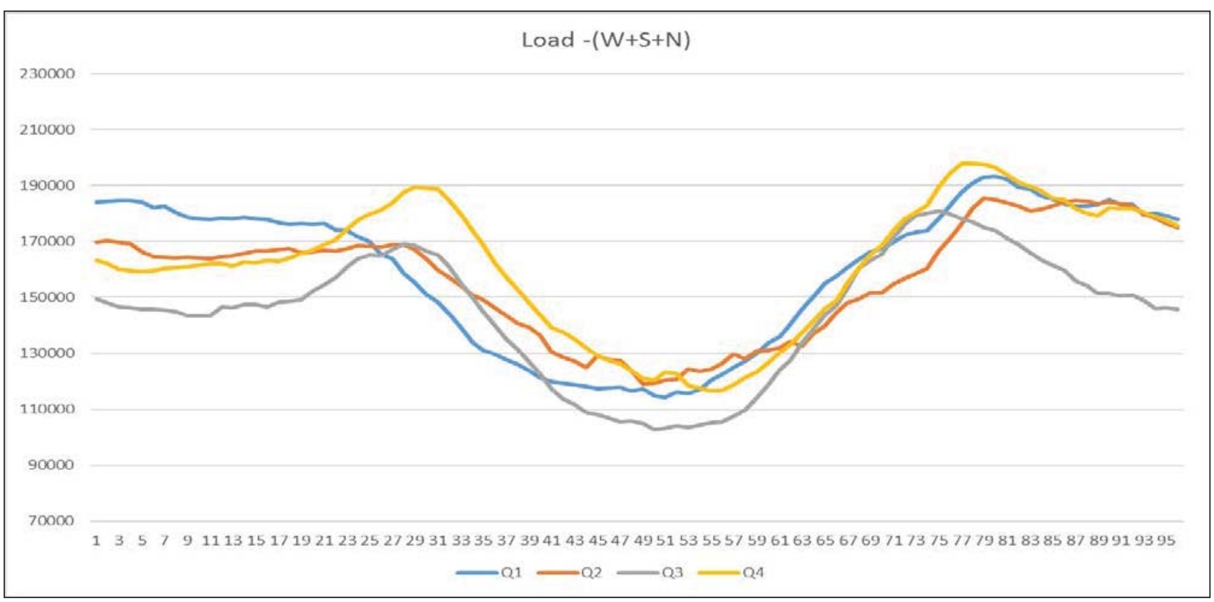
11.9.2 Accordingly, it is necessary to estimate the demand incident on thermal plant i.e. we first deduct wind, solar and nuclear from the demand curve which are operated as must run. Then we take out hydro generation which is also required to meet evening and morning peaks, so that the remaining would be required to be met from thermal generation. The curve so obtained thus contains the variability of not only wind+solar butt also that of load. We should have sufficient resource to provide continuous ramping for the required duration of net load ramp, for this we have to calculate the total balancing reserve.

11.9.3 Step-wise curves, as discussed above are given below:

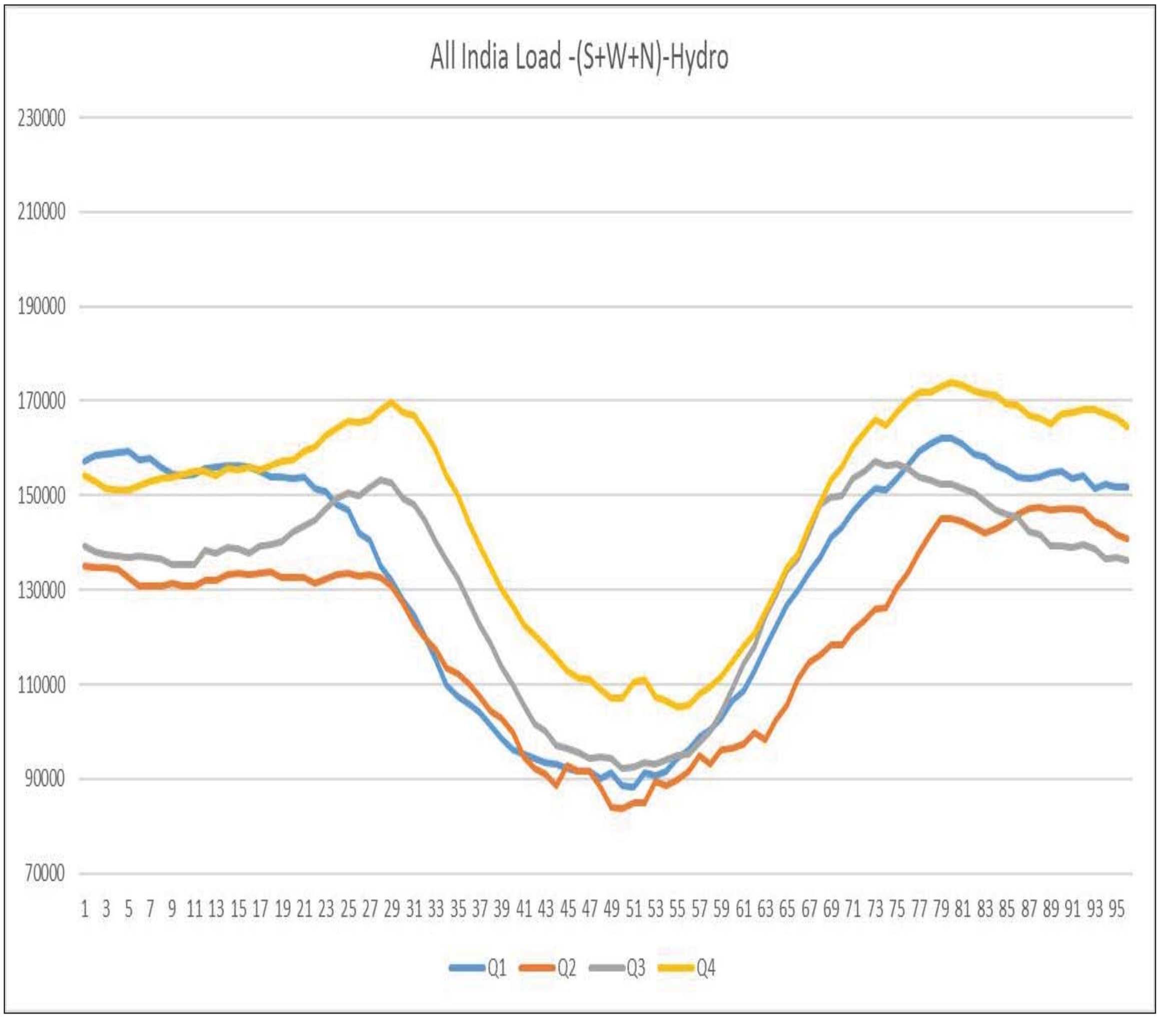
(i) All India load curve in 2021-22 for different quarter (for a typical day)



(ii) Anticipated All India load curve after deducting the load met from must-run plants i.e. wind, solar and nuclear generations, for different quarter of 2021-22 (for 160 GW RES):



(iii) Anticipated All India load curve after deducting the load met from must-run plants i.e. wind, solar and nuclear generations, and generation from hydro plants, for different quarter of 2021-22 (for 160 GW RES)



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11.9.4 Thus, it is the above load curve (at iii, above) which must be supplied by the thermal generation. We can conduct the statistical study, that was carried out for assessing RES variability, to assess the quantum of balancing power which the thermal generations would have to supply.

Result of the study are given below:

Thermal Installed Capacity	:	**301599 MW**
Peak Demand	:	**232469 MW**
Maximum thermal dispatch	:	**189827 MW**
PLF of thermal plants (ex-gen. HV bus)	:	**45.5(%)**

Duration	Max Ramp Up	Max Ramp Down	98% Ramp Up/Ramp down	MW/hour Ramp Up/ Down	MW/hour/ Peak demand (%)
15 min w.r.t. 1hour avg	11021	-10329	6960/ -6480	27840	11.97
15 Min	10316	-11011	5760/ -5520	23040	9.91
1 hour	27092	-26807	19040/ -19040	19040	8.19
2 hour	47146	-44834	34560/ -34560	17280	7.43
3 hour	59384	-60343	46800/ -46800	15600	6.71
6 hour	83985	-78345	68000/ -64600	11333	4.87

11.9.5 From above study it can be inferred that about 24500 MW/hour of balancing power would be needed on all-India basis which should respond within 15-minutes. Further, on daily basis, up to 45000 MW of capacity would be needed which should be able to respond within 3-hours and about 65-70,000 MW capacity which should respond within 6 - 7 hours on all-India basis should be provided. This capacity can further be distributed among various regions considering the RES capacity in that region, its behaviour with respect to load, availability of hydro capacity etc, as given below. The some of the balancing capacity required for Northern and Southern regions may also be kept in Western and Eastern regions depending on availability of thermal capacity in these regions.

Region	For 3 hour (MW)	For 6-7 hour (MW)	MW/hour
Northern Region	13000	18800	7000
Western Region	12000	17500	6000
Southern Region	15000	21500	8500
Eastern + North-Eastern Region	5000	7200	3000
All India	45000	65000-70000	24500

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CHAPTER - 12

RES PROJECTS AND THEIR ASSOCIATED TRANSMISSION SYSTEM

12.1 PLANNING OF TRANSMISSION SYSTEM FOR RES

12.1.1 As discussed in previous chapters of this report, the transmission system serves the purpose of evacuation of power from generation projects. For the Renewable Energy Sources (RES), which get connected to the grid at transmission level, their transmission system for their integration and evacuation of their power is planned in almost the same manner as that for conventional generating stations, except for some of the aspects as has been specifically provided in the Manual on Transmission Planning Criteria.

12.1.2 The detailed analysis of transmission system (ATS) required for connectivity and evacuation of power from a specific RES generation plant (i.e. wind farm OR solar park), is generally carried out as part of coordinated Transmission Planning Process.

12.1.3 In addition to the ATS, transmission system is also needed to integrate the RES, both the plant based i.e. wind-farm or solar park, as well as the roof top generations, so as to transfer power between States or regions which are surplus or deficit of RES power. The details of such analysis has been provided in Chapter-5.

12.2 ASSOCIATED TRANSMISSION SYSTEM FOR RES PROJECTS

The associated transmission systems(ATS) for following plant-based RES generation projects, for which location and quantum is known and which are expected to be commissioned up to 2021-22, are given in this chapter. Some of these plants/and their associated transmission systems are under construction and for others, it is under planning process. The details are given region-wise.

12.3 ATS FOR RES IN NORTHERN REGION

ATS for following RES generation projects in Northern Region have been provided:

Sl. No.	Reg.	State	Project	Wind/ Solar	Capacity, MW	Table No
1	NR	Rajasthan	Saurya Urja	Solar	500	RAJ 01-I
2	NR	Rajasthan	Adani Solar Power	Solar	500	RAJ 01-II
3	NR	Rajasthan	Essel Solar Power Park	Solar	750	RAJ 01-III
4	NR	Rajasthan	Adani Renewble Energy Park	Solar	1000	RAJ 02
5	NR	Haryana	Solar Project in Haryana	Solar	500	HAR 01
6	NR	Himachal Pradesh	Spiti Solar Project	Solar	1000	HP 01
7	NR	Uttar Pradesh	Solar Project in UP	Solar	600	UP 01
8	NR	Uttarakhand	Solar Project in Uttarakhand	Solar	50	UK 01
9	NR	Jammu Kashmir	Solar Park in J&K	Solar	100	JK 01

S.No : Raj 01-I

Name of RE Project : Saurya Urja (500 MW)

State : **Rajasthan**

Owner of RE Project : Saurya Urja Private ltd

Location : Bhadla (Jodhpur)

CoD : 2017 **Capacity : 500 MW Type: Solar**

Beneficiaries : NR

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C,	Length, km	MVA/MVAR/no of line bays	Remarks
1	SPP – Bhadla Pooling Station 220kV D/C line	220 kV	D/C	18		

Implementing Agency	SPPD

S.No : Raj 01-II

Name of RE Project : Adani Solar Power Park **(500 MW)**

State : **Rajasthan**

Owner of RE Project : ADANI

Location :	Bhadla (Jodhpur)

CoD : March 2017	**Capacity** :	**500MW**	**Type: Solar**
Beneficiaries : NR			

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C	Length, km	MVA/MVAR/no of line bays	Remarks
1	SPP – Bhadla Pooling Station 220kV D/C line	220 kV	D/C	20		

Implementing Agency	SPPD

S.No : Raj 01-III

Name of RE Project :	Essel Solar Power Park **(750 MW)**

State :	**Rajasthan**		
		Owner of RE Project :	Essel Saurya Urja Company of Rajasthan Ltd
Location :	Phalodi & Pokaran, Distt. Jodhpur/Jaisalmer		

CoD : July, 2017	**Capacity** :	**750MW**	**Type: Solar**
Beneficiaries : NR-400 MW WR-350 MW.			

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	SPP – Bhadla Pooling Station 400kV D/C line	400 kV	D/C	65		

Implementing Agency	SPPD

Common Transmission System for Integration of the RE Projects at S.No. 01-I,01-II, 01-III under the scheme Ultra Mega Solar Parks in Bhadla, Distt. Rajasthan:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Bhadla (PG) – Bikaner(PG) 765kV D/C line	765kV	D/C			ISTS
2	Bhadla (PG)- Bhadla (RVPN) 400kV D/C (Quad) line	400KV	D/C			ISTS
3	Establishment of Pooling Station at Bhadla (PG) (765/400kV : 3x1500MVA 400/220kV :	765/ 400kV	ICT		3x1500 MVA	ISTS
		400/ 220kV	ICT		3x500 MVA	ISTS
5	2 nos. 400kV & 4 nos. 220kV line bays at Bhadla (PG) for interconnection of SPPDs	400kV		2 nos., line bays		ISTS
		220		4 nos. line bays		ISTS
6	1x240 MVAr switchable line reactor at each end (each ckt) of the 765kVBhadla(PG)-Bikaner(PG) D/c line	765kV				ISTS
	1x240 MVAr (765kV) & 1x125MVAr (400kV) Bus reactor at Bhadla Pooling Station	765kV , 400kV				ISTS

S.No : Raj 02

Name of RE Project : Adani Renewable Energy Park Rajasthan (AREPL) **(1000 MW)**

State : **Rajasthan**		Owner of RE Project	: AREPL
Location : Fatehgarh Distt. Jaisalmer			

CoD : Dec 2017	**Capacity**	**: 1000MW**	**Type: Solar**
Beneficiaries : NR			

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C,	Length, km	MVA/MVAR/no of line bays	Remarks
1	SPP – Fatehgarh Pooling	400	D/C	-		SPPD

	Station 400kV D/C line	kV				

Implementing Agency	SPPD

Transmission System for Integration of the RE Projects at S.No. 02-I under the scheme Ultra Mega Solar Park in Fatehgarh, distt. Jaisalmer Rajasthan

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or	Length, km	MVA/MVAR/no of line bays	Remarks
1	765kV Fatehgarh Pool - Bhadla (PG) D/c line (initially to be operated at 400kV)	765kV	D/C			TBCB
2	2 nos. 400kV line bays at Fatehgarh PS for interconnection of Solar plants	400KV				TBCB
3	Establishment of 400kV Pooling Station at Fatehgarh (with a provision to upgrade at 765kV level)					TBCB
4	2 nos. 400kV line bays at Bhadla (PG)	400kV	D/C			TBCB
6	1x125 MVAR Bus reactor at 400kV Fatehgarh pooling station	400kV				TBCB

Implementing Agency	TBCB

Common Evacuation System for Renewable Energy generations located in WR and NR to Northern Region states

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or	Length, km	MVA/MVAR/no of line bays	Remarks
1.	Bhuj Pool–Banaskanta 765 kV D/c	765kV	D/C			ISTS
2.	Banaskanta -Chittorgarh 765 kV D/c	765kV	D/C			ISTS
3.	765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) substation each at Bhuj Pool and Banaskanta		D/C	765/400 kV-2x1500 MVA & 400/220kV-2x500MVA)		ISTS
4.	Banaskanta-Sankhari 400	400kV	D/C			ISTS

	kV D/c				
5.	Chittorgarh-Ajmer (New) 765 kV D/c	765kV	D/C		ISTS
6.	Ajmer (New)-Bikaner(New) 765 kV D/c	765kV	D/C		ISTS
7.	Bikaner(New) – Moga(PG) 765 kV D/c	765kV	D/C		ISTS
8.	LILO of one circuit of 400kV Bhadla-Bikaner(RVPN) line at Bikaner(New)	400kV	D/C		ISTS
9.	Establishment of 2x1500 MVA, 765/400 kV sub-station each at Chittorgarh	765/400 kV		765/400 kV	ISTS
10.	Establishment of 2x1500 MVA, 765/400 kV S/s at Bikaner (New)	765/400 kV	D/C	765/400 kV	ISTS

S.No : HAR-01

Name of RE Project : Solar Project in Haryana

State	:	**Haryana**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Bugan Dist. Hisar,Baralu &Singhani Dist. Bhiwani,Daukhera in Dist. Mahindergarh**			

COD :	Capacity : 500 MW (it is assumed to divide equal capacity among four location)
Beneficiaries :	

Proposed Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Establishment Pooling station each at Bagun, Barula,Singhani and Daukhera	220/132			2X100	

2	Line from Bagun to hisar	220	D/C			
3	Line from Barula to mahindergarh	220	D/C			
4	Line from Singhani to Mahindergarh	220	D/C			
5	Line from Daukhera to Rewari	220	D/C			

Implementing Agency	:	Saur Urja Nigam Ltd. & Haryana Power Generation Company Limited (HPGCL)

S.No : HP-01

Name of RE Project	:	**Spiti Solar Project**

State	:	**Himachal Pradesh**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Spiti Valley of Lahaul & Spiti District**			

COD :	Capacity : 1000 MW
Beneficiaries :	

Proposed Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Establishment of HVDC Bi-pole Terminals at Spiti Valley	+/- 325			3x500	
2	Spiti Valley Pooling Point –Wangtu +/-325 D/C HVDC Bi-Pole	+/- 325	D/C			
3	Line from Wangtu to Mohali	400	D/C			
4	Establishment of 400/220 Transformers at Mohali	400/220			2x500	
5	LILO of Nallagarh –Patiala Line at Mohali	220	D/C			
6	Line from Mohali to	400	D/C			

	Malekotla					

Implementing Agency	:	HP State Board Ltd.

S.No : UP-01

Name of RE Project	**:**	**Solar Project in UP**

State	:	**Uttar Pradesh**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Jalaun,Allahabad, Mirzapur & Kanpur Dehat Districts**			

COD :	Capacity :600 MW(Jalaun 265 MW, Allahabad 75MW, Mirzapur 50MW & Kanpur Dehat 50MW**)**
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
Transmission System for Solar Power Parks at Jalaun, UP						
1	Augmentation of transformation Capacity at 400/220kV Bhandrekhi(Orai) with 2x160 MVA ,220/132 transformer	220/132			2x160	
2	Line from Parasan(solar Plant) to Bhadrekhi(orai)	132kV	D/C			
3	Line from Gurrah(solar Plant) to Bhadrekhi (orai)	132kV	D/C			
4	Line from Makreccha (solar Plant) to Bhadrekhi (orai)	132kV	D/C			
5	Line from Parasan(solar Plant) to Bhadrekhi(orai)	132kV	D/C			
5	LILO of 132kV Makreccha(solar Plant) – Bhandrekhi 400 Line at		D/C			

	Baghuli(Solar Plant)					
6	Line from Tikar-II (solar Plant)-Rahaiya(orai)	33kV	D/C			Panther Conductor
7	2 No.s 33kV line bay at Rahiya S/S	33kV				
8	Line from Bhadrekhi to Bah(agra)	220	S/C			
9	Line from Bhadrekhi to Sikandera (Kanpur Dehat)	220	S/C			
10	Line from Bah(agra) to Sirsaganj	220	S/C			
11	Line from Bhadrekhi (Orai) to Jalun	132	S/C			
Transmission System for Solar Power Parks at Mirzapur, Allahabad and Kanpur						
1	Line from Meja to Kosda Kala(Solar Plant) Meja	132	D/C			
2	Line from Jigna to Dadar Vijaypur (Solar Plant), Mirzapur	132	D/C			
3	2 Nos. bays at Jigna S/S	132kV				
4	2 Nos. bays at Meja S/S	132kV				
5	Line from Gujrai (Solar Plant) to Pukhraya	132	D/C			
6	2 Nos. bays at Pukhraya S/S	132kV				

Implementing Agency	:	Lucknow Solar Power Development Co. Ltd. ,JVC of UPNEDA and SECI

S.No : UK-01

Name of RE Project	**:**	**Solar Project in Uttarakhand**

State	:	**Uttarakhand**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Industrial area Sitarganj (Phase I)& (Phase II) and Industrial Area Kashipur**			

COD :			Capacity : 50 MW
Beneficiaries	:	Intrastate	

Implementing	:	State Industrial

Agency		Development Corporation Uttarakhand Limited (SIDCUL)

Transmission System: to be connected at lower voltage level in state network

S.No : JK-01

Name of RE Project	:	**Solar Project in J&K**

State	:	**Jammu Kashmir**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Mohgrah & Badla Brahmanin Distt. Samba**			

COD :			Capacity : 100 MW
Beneficiaries	:	Intrastate	

Proposed Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
3	Line from Solar Park near Mohagarh/Badla Brahman to Jammu	220	D/C			
4	Establishment of Substaion at Mohagarh/Badla Brahman	220/132			2x100	

Implementing Agency	:	J&K Energy Development Agency

12.4 ATS FOR RES IN WESTERN REGION

ATS for following RES generation projects in Western Region have been provided:

Sl. No.	Reg.	State	Project	Wind/ Solar	Capacity, MW	Table No
1	WR	M.P.	Suwasara Solar Park	Solar	250	MP 01
2	WR	M.P	Neemuch Solar Park	Solar	500	MP 02

Sl. No.	Reg.	State	Project	Wind/ Solar	Capacity, MW	Table No
3	WR	M.P	Rajgarh,Agar,& Shajapur Solar park	Solar	750	MP 03
4	WR	M.P	Chattarpur Solar Park	Solar	500	MP 04
5	WR	M.P	Morena Solar Park	Solar	250	MP 05
6	WR	M.P	Rewa Ultra Mega Solar Power Park	Solar	750	MP 06
7	WR	M.P	SEI Sunshine Power Private Ltd	Solar	180	MP 07
8	WR	Gujarat	Banaskantha (Radhanesda) Solar Park	Solar	700	GJ 01
9	WR	Gujarat	Srijan Wind Farm	Wind	300	GJ 02
10	WR	Gujarat	Renew Power Ventures Pvt. Ltd	Wind	400	GJ 03
11	WR	Gujarat	Ostro Kutch Wind Pvt. LTd	Wind	300	GJ 04
12	WR	Gujarat	Adani Green Energy Ltd	Solar	300	GJ 05
13	WR	Chhtsgrh.	Chhattisgarh Solar Project	Solar	500	CHH 01

S.No : MP 01

Name of RE Project : Suwasara Solar Park (250 MW)

State	:	**M.P.**	Owner of RE Project	:	RUMS
Location	:	Distt. Mandsaur			

CoD	:	March 2017	**Capacity**	**:**	**250 MW**	**Type: Solar**
Beneficiaries	:	Intrastate, MP				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Suwasra Solar Park – Sitamau (Mandsaur)	220 kV	D/C	50 km		SPPD
2	Sitamau (Mandsaur) Substation	400 / 220 kV				MPPTCL

3	Sitamau (Mandsaur) - Nagda	400 kV	D/C	100km		MPPTCL

Implementing Agency	MPPTCL / SPPD

S.No : MP 02

Name of RE Project	**:**	**Neemuch Solar Park (500 MW)** [Consists of Rampura Solar Park -150 MW, Singoli Solar Park - 200 MW and Jeeran Solar Park -150 MW]

State	:	**M.P.**			
			Owner of RE Project	:	RUMS
Location	:	Distt. Neemuch			

CoD	:		**Capacity**	**:**	**500 MW**	**Type: Solar**
Beneficiaries	:	Not yet applied for LTA				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Establishment of 1 x 500 MVA (3rd) transformer at Sitamau (Mandsaur) PS	400 / 220 kV	ICT		500 MVA	MPPTCL
2	Establishment of Ratangarh PS	220 KV				MPPTCL
3	Rampura SP – Sitamau (Mandsaur) S/s line	220 kV	D/C	60 km		SPPD
4	Jeeran SP - Sitamau (Mandsaur) S/s Line	220 kV	D/C	60 km		SPPD
5	Singoli SP – Ratangarh Line	220 kV	D/C	30 km		SPPD

Implementing Agency	MPPTCL / SPPD

S.No : MP 03

Name of RE Project	**:**	**Agar SP (250 MW: Agar – 125 MW & Susner – 125 MW), Rajagrh SP (250 MW: Jeerapur – 125 & Khilchipur - 125) & Shajapur SP (250 MW: Moman Badodiya - 250 MW)**

State	:	**M.P.**	Owner of RE Project	:	RUMS
Location	:	Dist: Rajgarh, Agar & Shajapur			

CoD	:		**Capacity**	**:**	**750 MW**	**Type: Solar**
Beneficiaries	:	Not yet applied for LTA				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Establishment of Pooling Station at Jeerapur	400 / 220 kV			2 x 500 MVA	ISTS
2	Bus Reactor at Jeerapur Pooling station	420 kV			1x125 MVAR	ISTS
3	LILO of RAPP – Shujalpur 400 kV D/C at Jeerapur PS	400 kV	D/C			ISTS
4	line bays at Jeerapur PS for solar parks interconnection	220 kV			10 nos.	ISTS
5	Agar SP – Jeerapur Pooling station Line	220 kV	D/C	35 km		SPPD
6	Susner SP – Jeerapur Pooling station Line	220 kV	D/C	20 km		SPPD
7	Jeerapur SP – Jeerapur Pooling Station Line	220 kV	D/C			SPPD
8	Khilchipur SP– Jeerapur Pooling station Line	220 kV	D/C	20 km		SPPD
9	Moman Badodiya SP – Jeerapur Pooling station Line	220 kV	D/C	45 km		SPPD

Implementing Agency	ISTS Licensee / SPPD

S.No : MP 04

Name of RE Project	**:**	**Chattarpur Solar Park (500 MW)**

State	:	**M.P.**

Location : Distt. Chattarpur		Owner of RE Project	: RUMS

CoD :		**Capacity : 500 MW**	**Type: Solar**
Beneficiaries : Not yet applied for LTA			

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR /no of line bays	Remarks
1	Pooling Station at Bijawar	400 / 220 kV	ICT		2 X 500 MVA	ISTS
2	LILO of Satna – Bina (1st) D/c line at Bijawar PS	400 kV	D/C			ISTS
3	Bus Reactor at Bijawar Pooling Station	420 kV			1X125 Mvar	ISTS
4	line bays at Bijawar PS for LILO of Tikamgarh - Chatarpur D/C	220 kV			4 nos.	ISTS
5	Line bays at Bijawar PS for solar park interconnections	220kV			4 nos.	ISTS
6	Chattarpur Solarpark – Bijawar PS	220 kV	D/C		2	SPPD
7	Stringing of 2nd circuit of 220 kV Tikamgarh – Chhatarpur line	220kV				MPPTCL
8	LILO of Tikamgarh - Chhatarpur 220 kV D/c line at Bijawar PS	220kV		60 km		MPPTCL

Implementing Agency	ISTS Licensee / SPPD/ MPPTCL

S.No : MP 05

Name of RE Project	**: Morena Solar Park (250 MW)**

State : **M.P.**			
		Owner of RE	: RUMS

			Project		
Location	:	Distt. Morena			

CoD	:		**Capacity**	**:**	**250 MW**	**Type: Solar**
Beneficiaries	:	Not yet applied for LTA				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Morena SP - Morena S/s (MPPTCL) line	220 kV	D/c	22 km		SPPD
Or						
2	Morena SP - Morena 400/220 S/s (ISTS) line	220 kV	D/c	22 km		SPPD

Implementing Agency	SPPD

S.No : MP 06

Name of RE Project : Rewa Ultra Mega Solar Power Park (750 MW)

State	:	**M.P.**			
			Owner of RE Project	:	RUMS
Location	:	Distt. Rewa			

CoD	:	2016	**Capacity**	**:**	**750 MW**	**Type: Solar**
Beneficiaries	:	WR (550 MW) and NR (200 MW)				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Pooling Station at Rewa	400 / 220 kV			3 x 500 MVA	ISTS

2	LILO of Vindhyachal – Jabalpur 400kV 2nd D/c (circuit-3&4) at Rewa PS	400 kV		59 km		ISTS
3	Bus reactor at Rewa Pooling Station	420 kV			1x125 MVAr	ISTS
4	Line bays at Rewa Pooling station (for interconnection with solar park)	220 kV			6 Nos.	ISTS
5	RUMS SP – Rewa PS line along with associated bays at Solar Park	220 kV	3 x D/c			RUMS (SPPD)

Implementing Agency	POWERGRID/ SPPD

S.No : MP 07

Name of RE Project : SEI Sunshine Power Private Limited (SSPPL)

State	:	**M.P.**	Owner of RE Project	:	SSPPL
Location	:	Distt. Shivpuri			

CoD	:		**Capacity**	**:**	**180 MW**	**Type: Solar**
Beneficiaries	:	Delhi (NR)				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Sunshine Solar Project - Shivpuri S/s (MPPTCL)	220 kV	D/C			Project Developer

Implementing Agency	Project Developer

S.No : GJ 01

Name of RE Project : Banaskantha (Radhanesda) Solar Power Park (700 MW)

State	:	**Gujarat**	Owner of RE	:	Gujarat Power

			Project		Corporation Limited (GPCL)
Location	:	Banaskantha			

CoD	:	2017	**Capacity**	**:**	**700 MW**	**Type: Solar**
Beneficiaries	:	Gujarat, WR				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Banaskantha (Radhanesda) Pooling Station	220 / 400 kV				SPPD
2	Banaskantha (Radhanesda) Pooling Station – Banaskantha (PG) line	400 kV	D/C			ISTS
3	400 kV line bays at Bansakanta (PG) S/S for Banaskantha (Radhanesda) PS – Banaskantha (PG)	400 kV			2 nos.	ISTS
4	400 kV line bays at Banaskantha (Radhanesda) PS for Banaskantha (Radhanesda) PS – Banaskantha (PG)	400 kV			2 nos.	SPPD

Implementing Agency	POWERGRID /SPPD

S.No : GJ 02

Name of RE Project	**:**	**Srijan Wind farm (SESPL)**

State	:	**Gujarat**			
			Owner of RE Project	:	Srijan Energy System Pvt. Ltd. (SESPL)
Location	:	Distt. Bhuj			

CoD	:	2018	**Capacity**	**:**	**300 MW**	**Type:**

		Wind
Beneficiaries	:	WR, SR and NR

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Srijan WS – Bhuj PS line along with line bays at both ends	220kV	D/c			WPPD
2	Installation of ICT at Bhuj PS	400 / 220 kV			2 x 500 MVA	PGCIL

Implementing Agency	PGCIL/WPPD

S.No : GJ 03

Name of RE Project : Renew Power Ventures Pvt. Ltd

State	:	**Gujarat**			
			Owner of RE Project	:	RPVPL
Location	:	Distt. Kutch			

CoD	:	2018	**Capacity**	:	**400 MW**	**Type: Wind**
Beneficiaries	:	Only connectivity application				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	RPVPL – Bhachau line along with associated line bays at both ends	220 kV	D/c	45 Km		Project Developer

Implementing Agency	Project Developer

S.No : GJ 04

Name of RE Project : Ostro Kutch Wind Pvt. Ltd.

State	:	**Gujarat**	Owner of RE Project	:	OKWPL
Location	:	Distt. Kutch			

CoD	:	2018	**Capacity**	**:**	**300 MW**	**Type: Wind**
Beneficiaries	:					

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	OKWPL – Bhachau line along with associated line bays at both ends	220 kV	D/c	5 Km		Project Developer

Implementing Agency	Project Developer

S.No : GJ 05

Name of RE Project	**:**	**Adani Green Energy Ltd. (AGEL)**

State	:	**Gujarat**	Owner of RE Project	:	AGEL
Location	:	Distt. Patan			

CoD	:	Dec, 2016	**Capacity**	**:**	**300 MW**	**Type: Solar**
Beneficiaries	:	Connectivity application				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	AGEL - Sami (Adani) line (along-with associated line bays at both ends)	220kV	D/c	15 Km		AGEL

2	ICT at Sami (Adani) substation	400 / 220 kV			1 x 500 MVA	AGEL

Implementing Agency	:	M/s Adani Green Energy Limited

S.No : CHH-01

Name of RE Project	**:**	**Chhattisgarh Solar Project**

State	:	**Chhattisgarh**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Rajnand, Janjgir of Champa Dist.**			

COD :	Capacity : 500 MW
Beneficiaries :	

Proposed Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Establishment of Pooling station each at Rajnandgaon &janjgir-Champa	220/132			2x200	
2	Line from Rajnandgaon to bhilai	220	D/C			
3	Line from Janjgir to Mopka	220	D/C			

Implementing Agency	:	Chhattisgarh State Renewable Energy Development Agency (CREDA)

12.5 ATS FOR RES IN SOUTHERN REGION

ATS for following RES generation projects in Southern Region have been provided:

Sl. No .	Reg .	State	Project	Wind/ Solar	Capacity, MW	Table No
1	SR	Telgn.	Gattu Solar Park	Solar	500	TEL-01
2	SR	AP	N.P. Kunta Solar Park Project	Solar	1500	AP-01
3	SR	AP	Ghani/ Panyam Solar Project	Solar	1000	AP-02
4	SR	AP	Aspiri Wind Project	Wind	1000	AP-03
5	SR	AP	Suzlon Power Project	Wind	300	AP-04
6	SR	AP	Various, at Uravakonda area	Wind	1361	AP-05-I
7	SR	AP	Various, at Kondapuram area	Wind	1109	AP-05-II
8	SR	AP	Various, at Hindupur area	Wind	680	AP-05-III
9	SR	AP	Mailavaram disst. Kadapa	solar	1000	AP-06
10	SR	AP	Talaricheruvu Disst Anantpur	solar	500	AP-07
11	SR	Karntk.	Tumkur (Pavgada) Ultra Mega Solar Park	Solar	2000	Ktk-01
12	SR	Karntk.	Gadag wind Project	Wind	80	Ktk-02-I
13	SR	Karntk.	Dhoni wind Project	Wind	587	Ktk-02-II
14	SR	Karntk.	Harti wind Project	Wind	244	Ktk-02-III
15	SR	Karntk.	Gadag wind Project	Wind	90	Ktk-02-IV
16	SR	Karntk.	Gadag wind Project	Wind	197	Ktk-02-V
17	SR	Karntk.	Jagalur wind Project	Wind	177	Ktk-03-I
18	SR	Karntk.	Thalak wind Project	Wind	250	Ktk-03-II
19	SR	Karntk.	Thalak Solar Project	Solar	200	Ktk-03-III
20	SR	Karntk.	Guttur Wind Project	Wind	518	Ktk-03-IV
21	SR	Karntk.	Davangere and Chitradurga wind(Proposed) Project	Wind	60	Ktk-03-V
22	SR	Karntk.	Davangere and Chitradurga wind (connected)	Wind	406	Ktk-03-VI
23	SR	Karntk.	Athani wind 240 MW Project	Wind	240	Ktk-04-I
24	SR	Karntk.	Chikkodi wind 92 MW Project	Wind	92	Ktk-04-II
25	SR	Karntk.	Chikkodi, Ghatprabha, Belgaum wind 110MW Project	Wind	110	Ktk-04-III
26	SR	Karntk.	Chikkodi, Ghatprabha, Belgaum wind 418 MW Project	Wind	418	Ktk-04-IV
27	SR	Karntk.	Atria Hydel -12 MW	Hydel	12	Ktk-05-I
28	SR	Karntk.	Cauvery Hydro-3 MW	Hydro	3	Ktk-05-II
29	SR	Karntk.	Pioneer power-24.75 MW	Hydro	24.75	Ktk-05-III
30	SR	Karntk.	Pioneer power-24.75 MW	Hydro	24.75	Ktk-05-IV
31	SR	Tamil Nadu	Mytrah Energy (India) - 300 MW Wind Project	Wind	300	TN-01-I
32	SR	Tamil Nadu	Samimeru Windfarms Wind Project, 48.5 MW	Wind	48.5	TN-01-II
33	SR	Tamil Nadu	SISL Green Infra - 48.5 MW Wind Project	Wind	48.5	TN-01-III

Sl. No.	Reg.	State	Project	Wind/ Solar	Capacity, MW	Table No
34	SR	Tamil Nadu	Samiran Udaipur Wind farms - 48.5 MW	Wind	48.5	TN-01-IV
35	SR	Tamil Nadu	Shivam Filaments Wind Projects- 48.5 MW	Wind	48.5	TN-01-V
36	SR	Tamil Nadu	R.S. India Global Energy Wind Project- 480 MW	Wind	480	TN-01-VI
37	SR	Tamil Nadu	Suzlon Power Infrastructure Wind project- 1000 MW	Wind	1000	TN-01-VII
38	SR	Tamil Nadu	Suzlon Power Infrastructure Wind Project	Wind	350	TN-02-I
39	SR	Tamil Nadu	Vestas Wind Technology India Wind Project- 150 MW	Wind	150	TN-02-II
40	SR	Tamil Nadu	Wind Projects at Samugarengapuram	Wind	600	TN-03
41	SR	Tamil Nadu	Kamuthi Solar Park	Solar	1000	TN-04
42	SR	Kerala	Kottathara Project	Wind	80	KER-01
43	SR	Kerala	Vettathur Project	Wind	80	KER-02
44	SR	Kerala	Kuyilimala Wind Project	Wind	14.25	KER-03
45	SR	Kerala	Kasargod Solar Project	Solar	200	KER -04

S.No TEL-01

Name of RE Project	:	**Gattu Solar Park**

State	:	**Telengana**	Owner of RE Project	:	Telangana State
Location	:	Gattu, Mehboobnagar, Telengana			

CoD	:		Capacity	: 500MW	Type:	Solar
Beneficiaries	:	Telangana				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks

1	220/132 substation at Gattu	220/132			3X200	Yet to be agreed in SCPSPSR
2	Gattu Solar Park- Veltoor 220 kV D/C line	220 kV	D/C			
3	Gattu Solar Park- Thimmajipet 220kv D/C line	220 kV	D/C			

Implementing Agency	:	Telangana Transmission Corporation (TSTRANSCO)

S.No : AP-01

Name of RE Project : **N.P. Kunta Solar Park Project**

State	:	**Andhra Pradesh**			
			Owner of RE Project	:	AP state
Location	:	N.P. Kunta Mandal, Ananthapuram Distt. Of A.P.			

CoD	:		**Capacity**	:	**1500MW**	**Type: Solar**
Phase –I	:	250 MW-Dec,16.	Phase –I	:	250	
Phase- II:	:	750 MW- April,17	Phase –II	:	750	
Phase III:	:	500 MW- Sept, 17.	Phase –III	:	500	
Beneficiaries	:	:AP DISCOMS & Southern Region as target region				

Transmission System for Integration of the RE Project:

Phase- I:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	400/220 kV Substation NP Kunta Pooling SS	400/220 kV	3		3x500 MVA	Scheme finalized and agreed in SCPSPSR
2	LILO of 400KV Kadapa(Cuddapah) - Kolar S/c line at NP	400kV	S/C			

	Kunta Pooling Station					
3	Bus Reactor				1x125 MVAr	
4	Line bays at NP Kunta Pooling station	220 kV			2 Line bays required	
5	STATCOM at 400kV NP Kunta Pooling Station	400kV			±100 MVAR	

Phase II:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	LILO of Kadapa(Cuddapah) – Hindupur	400/220 kV	QM D/C			Scheme finalized and agreed in SCPSPSR
2	Line bays at NP Kunta Pooling station	220kV	QM D/C		6 Line bays Required.	

Phase III:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Augmentation of transformation capacity at NP Kunta station	400/220 kV	1 Trf		500	Scheme finalized and agreed in SCPSPSR
2	Line bays at NP Kunta Pooling station	220kV			4 Line bays Required	

Implementing Agency	:	PGCIL

S.No : AP-02

Name of RE Project	:	**Ghani/ Panyam Solar Project**

State	:	**Andhra Pradesh**	Owner of RE Project	:	AP state
Location	:	Distt. Kurnooll, AP			

CoD	:	by March 2017	**Capacity**	**:**	**1000MW** **Type: Solar**
Beneficiaries	:	Andhra Pradesh			

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	400/220 kV Substation at Ghani/ Panyam	400/220 kV	3 trf		3x500 MVA	Scheme finalized and agreed in SCPSPSR
2	Line from Kurnool to proposed 400kV Gani/Panyam SS	400kV	QM D/C	35		
3	Bay Extensions at Kurnool SS	400kV			2 Nos.	
4	Line from Jammalamadugu/ Kondapuram to the proposed 400kV Gani/Panyam SS	400kV	QMDC	90		
5	Bus Reactor at Panyam				2x125 MVAr	

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

S.No : AP-03

Name of RE Project	**:**	**Aspiri Wind Project**

State	:	**Andhra Pradesh**	Owner of RE Project	:	AP state
Location	:	Andhra Pradesh			

CoD	:	by 2017	**Capacity**	**:**	**1000MW** **Type: Wind**
Beneficiaries	:	Andhra Pradesh			

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C,	Length, km	MVA/MVA R/no of line	Remarks

			D/C, or no. of Trf)		bays	
1	400/220 kV Substation Aspiri	400/220 kV	3 trf		3x315MVA	Scheme finalized and agreed in SCPSPSR
2	Aspiri- Uravakonda SS	400kV	QM D/C			
3	Bus Reactor				2x125 MVAr	

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

S.No : AP-04

Name of RE Project	:	**Suzlon Power Project**

State	:	**Andhra Pradesh**	Type Owner of RE Project	: :	Wind AP state
Location	:	**Anantpur** Dist. of Andhra Pradesh			

CoD	:		**Capacity**	:	**300 MW**	**Type:Wind**
			1.	:	Suzlon Power Infrastructure Limited- 300 MW	
Beneficiaries	:	Tamil Nadu				

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	Suzlon wind farms – Gooty 230kV D/c line	230 kV	D/C			Yet to be agreed

Implementing Agency	:	**Suzlon**

S.No : AP-05-I

Name of RE Project	**:**	**Various, at Uravakonda area (1361 MW)**

State	:	**Andhra Pradesh**	Type	:	Wind
			Owner of RE Project	:	AP state
Location	:	**Uravakonda,** Andhra Pradesh			

CoD	:		**Capacity**	:	**1361 MW**	**Type:Wind**
Beneficiaries	:	Andhra Pradesh				

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

S.No : AP-05-II

Name of RE Project	**:**	**Various, at Kondapuram area (1109 MW)**

State	:	**Andhra Pradesh**			
			Owner of RE Project	:	AP state
Location	:	**Kondapuram,** Andhra Pradesh			

CoD	:		**Capacity**	:	**1109 MW**	**Type:Wind**
Beneficiaries	:	Andhra Pradesh				

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

S.No : AP-05-III

Name of RE Project	**:**	**Various, at Hindupur area (680 MW)**

State	:	**Andhra Pradesh**			
			Owner of RE Project	:	AP state
Location	:	**Hindupur,** Andhra Pradesh			

CoD	:	**Capacity**	:	**680 MW**	**Type:Wind**
Beneficiaries	:	Andhra Pradesh			

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

Transmission System for Integration of the RE Project at S.No : APr-05-I,II and III :

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1.	Substation at Uravakonda	400/220kV	4 trf		4x315 MVA	
2.	Substation at Hindupur - .	400/220kV			3x315 MVA PTRs 3x315 MVA	
3.	Substation at Jammalamadugu	400/220/132kV			4x315 MVA & 2x160 MVA	
4.	Line from 400kV Uravakonda SS to 400kV Mahaboobnagar SS	400kV	QMD/C	190		
5.	Line from 400kV Jammalamadugu to 400kV Uravakonda SS	400kV	QMD/C	110		
6.	Line from 400kV Jammalamadugu to 400kV Kurnool SS	400kV	QMD/C	125		
7.	Line from Hindupur SS to 400kV Uravakonda SS	400kV	QMD/C	130		
8.	Quad Bay Extensions at Mahaboobnagar 400kV Substation	400kV			2 Nos	
9.	Bus Rector 1 No.				80 MVAR	

10.	Bus Rector 1 No.				80 MVAR.	

S.No : AP-06

Name of RE Project :	**Mailavaram Solar Project**

State :	**Andhra Pradesh**	Owner of RE Project :	AP state
Location :	Distt. Kadapa, AP		

CoD :		**Capacity : 1000MW** **Type: Solar**
Beneficiaries :	Andhra Pradesh	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	400/220 kV Substation at Mailavaram	400/220 kV	3 trf		3x500 MVA	
2	Line from Mailavaram to Kondapuram(Jammaluamadugu)		QM D/C			
3	Bus Reactor at Mailavaram				1x125 MVAr	

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

S.No : AP-07

Name of RE Project :	**Talaricheruvu Solar Project**

State :	**Andhra Pradesh**	Owner of RE Project :	AP state
Location :	Distt. Anantpur, AP		

CoD :		**Capacity : 500MW** **Type: Solar**
Beneficiaries :	Andhra Pradesh	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA/MVAR/no of line bays	Remarks
1	400/220 kV Substation at Talaricheruvu	400/220 kV	2 trf		2x500 MVA	
2	LILO of Uravakonda-Kondapuram(Jammalamadugu)	400kV	QM D/C			
5	Bus Reactor at Talaricheruvu				1x125 MVAr	

Implementing Agency	:	Transmission Corporation of Andhra Pradesh (APTRANSCO)

S.No : Ktk-01

Name of RE Project	**:**	**Tumkur (Pavgada) Ultra Mega Solar Park**

State	:	**Karnataka**			
			Owner of RE Project	:	Karnataka State
Location	:	Pavagada, Tumkur Distt, Karnataka			

CoD	:		**Capacity**	**:**	**2000MW**	**Type:Solar**
Phase –I	:	Sep, 17	Phase –I	:	1000	
Phase –II	:	Sep, 18	Phase –II	:	1000	
Beneficiaries A:		:1600MW by Karnataka Discoms.				
B:		400MW by SR beneficiaries				

Transmission System for Integration of the RE Project:

Phase I:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	LILO of 400kV Gooty – Tumkur	400kV	D/C			

	(Vasantnarsapur) Line at Tumkur (Pavagada) Pooling station					
2	Tumkur (Pavagada) Pooling station - Hiriyur 400 kV D/c (as part of Tumkur (Pavagada) Pooling station - Mysore line	400kV	D/C			
3	LILO of 400kV Bellary Pool – Tumkur (Vasantnarsapur) D/c (Quad) (both circuits) [KPTCL line] at Tumkur (Pavagada) Pooling station	400	QM D/C			
4	Pooling station at Tumkur(Pavagada)	400/220KV	3		3x500 MVA	
5	Bus reactor at 400/220KV Tumkur (Pavagada) Pooling station					1x125MVAR
6	Line Bays at Tumkur (Pavagada) PS	220kV				8 Line bays Required

Phase II:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Hiriyur – Mysore line	400 kV	D/c			
2	Tumkur (Pavagada) Pooling station-Devanahally (KPTCL)	400kV	QM D/C			
3	Augmentation of transformer at Tumkur (Pavagada) Pooling station	400/220KV	2 trf		2x500 MVA	
4	Bus reactor (2nd) at Tumkur (Pavagada) Pooling Station					1x125MVAR
5	Third transformer at Tumkur (Vasantnarsapur)	400/220 kV	1 trf		1x500 MVA	
6	Switchable Line reactor at Mysore end of Hiriyur- Mysore D/c for each circuit.					1x80 MVAR

7	Line Bays at 400/220kV Tumkur (Pavagada) PS	220kV				8 nos.

Implementing Agency	:	Karnataka Solar Power Development Corporation Ltd.(KSPDCL) (JVC of SECI & KREDL)

S.No : Ktk-02-I

Name of RE Project : Gadag wind (80MW) Project

State : **Karnataka**

Owner of RE Project :Karnataka State

Location : In/around Dhoni, Karnataka

CoD : Capacity : 80 MW Type:Wind

Beneficiaries : Karnataka

S.No : Ktk-02-II

Name of RE Project : Dhoni wind (587 MW) Project

State : **Karnataka**

Owner of RE Project Karnataka State

Location : In/around Dhoni, Karnataka

CoD : Capacity : 587 MW Type:Wind

Beneficiaries : Karnataka

S.No : Ktk-02-III

Name of RE Project : Harti wind (244 MW) Project

State : **Karnataka**

		Owner of RE Project	:Karnataka State
Location	: In/around Dhoni, Karnataka		

CoD	:	Capacity : 244 MW	Type:Wind
Beneficiaries	: Karnataka		

S.No : Ktk-02-IV

Name of RE Project	**:**	**Gadag wind (90 MW) Project**

State	: Karnataka		
		Owner of RE Project	: Karnataka
Location	: In/around Dhoni, Karnataka		
CoD	:	**Capacity 90 MW**	**Type:Wind**
Beneficiaries	: Karnataka		

S.No : Ktk-02-V

Name of RE Project	**:**	**Gadag wind (197 MW) Project**

State	: Karnataka		
		Owner of RE Project	:Karnataka State
Location	: In/around Dhoni, Karnataka		

CoD	:	**Capacity 197 MW**	**Type:Wind**
Beneficiaries	: Karnataka		

The proposed wind generation coming up in /around Dhoni are as follows:

I. 80 MW of wind generation are connected to 220kV Gadag

II. 587(450+67+70) MW is proposed to be connected to 400/220kV Dhoni

III. 244 MW is proposed to be connected to 220kV Harti

IV. About 90 MW of wind generation are proposed in 110kV downstream of 220 kV

Gadag S/s V. About 197 MW of wind generation are connected to 110kV downstream of 220 kV Gadag S/s

Transmission System for Integration of Ktk-I,II,III,IV,V:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	400/220kV station at Dhoni in Mundaragi Taluk, Gadag District	400/220 Kv			2x500	
2	LILO'ing the existing S/C 400 KV line running between 400 KV station at Davanagere and Guddadahally.	400kV	S/C			
3	LILO'ing the existing 220KV D/C line running between 220 kV station at 35 Gadag and Lingapur to the 400/220 KV station at Dhoni.	220kV	D/C			

Implementing Agency	:	KPTCL

S.No : Ktk-03-I

Name of RE Project	**:**	**Jagalur wind (177 MW) Project**

State	:	**Karnataka**	Type	:	Wind/solar
			Owner of RE Project	:	Karnataka State
Location	:	In/around JagalurKarnataka			

CoD :	**Capacity**	**: 177 MW**	**Type:**	**Wind**
Beneficiaries : Karnataka				

S.No : Ktk-03-II

Name of RE Project	**:**	**Thalak wind (250 MW) Project**

State	:	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State
Location	:	In/around JagalurKarnataka			

CoD	:	**Capacity**	**250 MW**	**Type:Wind**
Beneficiaries	: Karnataka			

S.No : Ktk-03-III

Name of RE Project	**:**	**Thalak Solar (200 MW) Project**

State	:	**Karnataka**			
			Owner of RE Project	:	Karnataka State
Location	:	In/around JagalurKarnataka			

CoD	:	**Capacity**	**200 MW**	**Type: Solar**
Beneficiaries	: Karnataka			

S.No : Ktk-03-IV

Name of RE Project	**:**	**Guttur Wind (518 MW) Project**

State	:	**Karnataka**			
			Owner of RE Project	:	
Location	:	In/around JagalurKarnataka			

CoD	:	**Capacity**	**518 MW**	**Type: Wind**
Beneficiaries	: Karnataka			

S.No : Ktk-03-V

Name of RE Project	**:**	**Davangere and Chitradurga wind 60MW(Proposed) Project**

State	**:**	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State

Location	:	In/around JagalurKarnataka

CoD :		Capacity	60 MW	Type: Wind
Beneficiaries	: Karnataka			

S.No : Ktk-03-VI

Name of RE Project	**:**	**Davangere and Chitradurga wind 406 MW (connected)**

State	:	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State
Location	:	In/around JagalurKarnataka			

CoD :		**Capacity**	**406 MW**	**Type:Wind**
Beneficiaries	: Karnataka			

The proposed wind generation coming up in /around Jagalur are as follows:

I. 177(93+84) MW of wind generation are proposed to be connected to 220kV bus of 400/220kV Jagalur
II. 450(Wind=200+50; Solar=200) MW is proposed to be connected to 220kV Thalak
III. 518(218+300) MW is proposed to be connected to 220kV Guttur
IV. About 60 MW of wind generation are proposed in 66kV downstream of 220 kV Davangere and Chitradurga
V. About 406 MW of wind generation are connected to 66kV downstream of 220 kV Davangere and Chitradurga

Transmission System for Integration of the RE Project Ktk-03-I, II,III,IV,V

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	400/220kV station GIS Sub-station at Jagalur in Jagalur Taluk, Davanagere District.	400/220 kV			2x500	

2	LILO the proposed BTPS-CNHalli DC line at Jagalur substation	400kV	D/C			
3	220kV Drake ACSR line from proposed 400/220kV Jagalur substation to 220/66kV Thallak substation	220kV				Length of 40kms
4	220kV Drake ACSR line from proposed 400/220kV Jagalur substation to proposed 220/66/11kV Kudligi substation	220kV				length of 50kms
5	4Nos of 220kV line terminal bays(2 Nos each at 220/66kV Thallak and prop 220/66/11kV Kudligi substations)	220kV				
6	220kV DC line from Jagalur to Chitradurga	220kV	D/C			length of 50kms

Implementing Agency	:	KPTCL

S.No : Ktk-04-I

Name of RE Project	**:**	**Athani wind 240 MW Project (Proposed)**

State	:	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State
Location	:	In/around Mughalkod Karnataka			

CoD	:		**Capacity**	**240 MW**	**Type:Wind**
Beneficiaries	Karnataka				

S.No : Ktk-04-II

Name of RE Project	**:**	**Chikkodi wind 92 MW Project (Connected)**

State	:	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State
Location	:	In/around Mughalkod Karnataka			

CoD	:	**Capacity**	**92 MW**	**Type:Wind**
Beneficiaries:	Karnataka			

S.No : Ktk-04-III

Name of RE Project	**:**	**Chikkodi, Ghatprabha, Belgaum wind 110MW Project (Proposed)**

State	:	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State
Location	:	In/around Mughalkod Karnataka			

CoD	:	**Capacity**	**110 MW**	**Type:Wind**
Beneficiaries	Karnataka			

S.No : Ktk-04-IV

Name of RE Project	**:**	**Chikkodi, Ghatprabha, Belgaum wind 418 MW Project (Connected)**

State	:	**Karnataka**	Type	:	Wind
			Owner of RE Project	:	Karnataka State
Location	:	In/around Mughalkod Karnataka			

CoD	:	**Capacity**	**418MW**	**Type:Wind**
Beneficiaries	Karnataka			

The proposed wind generation coming up in /around Mughalkod are as follows:

I. 240 (160+80) MW of wind generation are proposed to be connected to 220kV Athani s/S
II. 92 MW is proposed to be connected to 220kV Chikkodi
III. About 110 MW of wind generation are proposed in 110kV downstream of 220 kV Chikkodi, Ghatprabha, Belgaum
IV. Some 418 MW are connected in 110 kV downstream of Chikkodi, Ghatprabha, Belgaum, Athani, Mahalingpur and Kudachi

Transmission System for Integration of the RE Project: Ktk-04-I, II, III, IV

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	220/110kV station Sub station at Mughalkod in Raibag Taluk, Belgaum District	220/110 kV			2x100	
2	110/11kV station Sub station at Mughalkod in Raibag Taluk, Belgaum District	110/11kV			1x10	
3	110kV DC line to link 220/110/11kV Mughalkod to 110/11kV Itnal substation	110kV	D/C			length of 5kms
4	110kV DC to link 220/110/11kV Mughalkod to link to lines connecting Hidkal and Sultanpur substations	110kV	D/C			length of 10kms
5	110kV DC line to link 220/110/11kV Mughalkod to lines connecting Mudalagi and Hunsyal substations	220kV	D/C			length of 15kms
6	110kV DC line to link 220/110/11kV Mughalkod to lines connecting Kuligod and Saidapur substations	220kV	D/C			length of 15kms

7	220kV DC line LILO ghataprabha –chikkodi	220Kv	D/C			Length of 40kms

Implementing Agency	:	KPTCL

S.No : Ktk-05-I

Name of RE Project	**:**	**Proposed wind/solar/mini hydro generation coming up in /around Shivanasamudram** Atria Hydel -12 MW

State	:	**Karnataka**	Owner of RE Project	:	Karnataka State
Location	:	**In/around Shivanasamudram Karnataka**			

CoD	:	**Capacity**	**12 MW**	**Type:Hydel**
Beneficiaries				

S.No : Ktk-05-II

Name of RE Project	**:**	**Proposed wind/solar/mini hydro generation coming up in /around Shivanasamudram** Cauvery Hydro-3 MW

State	:	**Karnataka**	Owner of RE Project	:	Karnataka State
Location	:	**In/around Shivanasamudram Karnataka**			

CoD	:	**Capacity**	**3 MW**	**Type:Hydro**
Beneficiaries				

S.No : Ktk-05-III

Name of RE Project	**:**	**Proposed wind/solar/mini hydro generation coming up in /around Shivanasamudram**

Pioneer power-24.75 MW

State	:	**Karnataka**	Owner of RE Project	:	Karnataka State
Location	:	**In/around Shivanasamudram Karnataka**			

CoD	:	**Capacity**	**24.75 MW**	**Type:Hydro**
Beneficiaries				

S.No : Ktk-05-IV

Name of RE Project	**:**	**Proposed wind/solar/mini hydro generation coming up in /around Shivanasamudram** Pioneer power -24.75 MW

State	:	**Karnataka**	Owner of RE Project	:	Karnataka State
Location	:	**In/around Shivanasamudram Karnataka**			

CoD	:	**Capacity**	**24.75 MW**	**Type:Hydro**
Beneficiaries				

The proposed wind/solar/mini hydro generation coming up in /around Shivanasamudram are as follows:

A. M/s Atria Hydel -12 MW
B. M/s Cauvery Hydro-3 MW
C. M/s Pioneer power-24.75 MW
D. M/s Pioneer power -24.75 MW

Transmission System for Integration of the RE Project Ktk -I,II,III,IV:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	220/66kV station Sub-station at Shivanasamudra,Malavalli taluk Mandya	220/66 kV			2x100	

2	66/11kV station Sub station at Shivanasamudra,Malavalli taluk Mandya	66/11kV			1x8	
3	220kV DC line to link 220Kv line to 220kv T.K. halli substation	220kV	D/C			length of 1.5kms
4	2200kV DC to link to 220kv line connecting 220kv Madhuvanahalli substations	220kV	D/C			length of 1.5 kms
5	220kV DC line in 220kv Hootagally-Vajamangala T.K. Halli SC line corridor including LILO to 220/66/11kV Vajamangala substation	220kV	D/C			length of 76 kms
6	220kv line terminal bays- 4Nos	220kV				One each at 220kv Hootagally and T.K. Halli and 2 Nos at Vajamangala
7	66kV linesto link M2 line T.K. halli lines,SFC line, kollegala line, Madhuvanhalli lines to 220/66/11kv Shivanasamudram	66Kv	D/C			Length of 5 kms

Implementing Agency	:	KPTCL

S.No : TN-01-I

Name of RE Project	**:**	**Mytrah Energy (India) - 300 MW Wind Project**

State	:	**Tamil Nadu(TN)**	Type	:	Wind
			Owner of RE Project	:	TN State
Location	:	**Tirunelveli,** Tamil Nadu			

CoD :		**Capacity : 300 MW Type:WInd**

Beneficiaries : Tamil Nadu		

S.No : TN-01-II

Name of RE Project	**: Samimeru Windfarms Wind Project, 48.5 MW**

State	:	**Tamil Nadu**	Owner of RE Project	:	TN State
Location	:	**Tirunelveli,** Tamil Nadu			

CoD	:		**Capacity**	: **48.5 MW**	**Type: Wind**
Beneficiaries	:	Tamil Nadu			

S.No : TN-01-III

Name of RE Project	**: SISL Green Infra - 48.5 MW Wind Project**

State	:	**Tamil Nadu**	Type	:	Wind
			Owner of RE Project	:	TN State
Location	:	**Tirunelveli,** Tamil Nadu			

CoD	:		**Capacity**	: **48.5 MW**	**Type: Wind**
Beneficiaries	:	Tamil Nadu			

S.No : TN-01-IV

Name of RE Project	**: Samiran Udaipur Wind farms - 48.5 MW**

State	:	**Tamil Nadu**	Type	:	Wind
			Owner of RE Project	:	
Location	:	**Tirunelveli,** Tamil Nadu			

CoD	:		**Capacity**	: **48.5 MW**	**Type: Wind**
Beneficiaries	:	Tamil Nadu			

S.No : TN-01-V

Name of RE Project	**: Shivam Filaments Wind Projects- 48.5 MW**

State	:	**Tamil Nadu**			
Name of RE Project	:		Owner of RE Project	:	
Location	:	**Tirunelveli,** Tamil Nadu			

CoD	:		**Capacity**	:	**48.5 MW Type: Wind**
Beneficiaries	:	Tamil Nadu			

S.No : TN-01-VI

Name of RE Project	**:**	**R.S. India Global Energy Wind Project- 480 MW**

State	:	**Tamil Nadu**	Type	:	Wind
			Owner of RE Project	:	
Location	:	**Tirunelveli,** Tamil Nadu			

CoD	:		**Capacity**	:	**480 MW Type: Wind**
Beneficiaries	:	Tamil Nadu			

S.No : TN-01-VII

Name of RE Project	**:**	**Suzlon Power Infrastructure Wind project- 1000 MW**

State	:	**Tamil Nadu**			
			Owner of RE Project	:	
Location	:	**Tirunelveli,** Tamil Nadu			

CoD	:		**Capacity**	:	**1000 MW Type: Wind**
Beneficiaries	:	Tamil Nadu			

Transmission System for Integration of the RE Project TN 01-I,II,III,IV,V,VI,VII:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Mytrah wind farms – Tirunelveli PS 230kV D/c line	230 kV	D/C			Mytrah Energy (India) Ltd
2	Samimeru wind farms	230 kV	D/C			Samimeru

	– Tirunelveli PS 230 kV D/c line					Windfarms Private Limited-48.5 MW SISL Green Infra Limited-48.5 MW Samiran Udaipur Wind farms Limited- 48.5 MW Shivam Filaments Private Limited-48.5 MW
3	RS India wind farms – Tirunelveli PS 230kV D/c line	230 kV	D/C			R.S. India Global Energy Limited
4	Suzlon wind farms – Tirunelveli PS 400kV D/c line	400 kV	D/C			Suzlon Power Infrastructure Limited
5	2x500 MVA, 400/230 kV GIS type S/s at Tirunelveli Pooling Station with Double Main and transfer bus arrangement	400/230 kV	trf		1000	
6	Tirunelveli Pooling Station – Tuticorin Pooling Station 400 kV 2xD/c (Quad) line	400 kV	D/C			
7	Bus Reactors at 400kV Tirunelveli Pooling Station	400kV				2x125 MVAR

Implementing Agency	:	

S.No : TN-02-I

Name of RE Project	:	Suzlon Power Infrastructure Wind Project

State	:	**Tamil Nadu**	Type	:	Wind
			Owner of RE Project	:	
Location	:	Coimbatore area of Tamil Nadu			

CoD	:		**Capacity**	:	**350 MW**	**Type: Wind**
Beneficiaries	:	Tamil Nadu				

S.No : TN-02-II

Name of RE Project	**:**	Vestas Wind Technology India Wind Project- 150 MW

State	:	**Tamil Nadu**	Type	:	Wind
			Owner of RE Project	:	
Location	:	Coimbatore area of Tamil Nadu			

CoD	:		Capacity	:	**150 MW**
Beneficiaries	:	Tamil Nadu			

Transmission System for Integration of the RE Project, TN-02-I, II:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Suzlon switchyard – Pugalur 230 kV D/c line	230 kV	D/C			Suzlon Power Infrastructure Limited
2	Vestas wind farms – Udumalpet 230kV D/c line	230 kV	D/C			Vestas Wind Technology India Private Limited

Implementing Agency	:	Suzlon Power Infrastructure Limited and Vestas Wind Technology India Private Limited

S.No : TN-03

Name of RE Project	**:**	**Wind Projects at Samugarengapuram**

State	:	**Tamil Nadu**	Type	:	Wind
Name of RE Project	:		Owner of RE Project	:	

Location	:	**Samugarengapuram**

CoD	:	Capacity	:	**600MW** **Type:Wind** .
Beneficiaries	:	Tamil Nadu		

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	ICT	400/230kV	Trf		2x315	
2	ICT	400/110kV	Trf		2x400	
3	400 KV D/C line from Udangudi Switchyard	400kV	D/C			
4	LILO of Kudankulam – SRPudur 230kV SC line	230kV	S/C			
5	LILO of Udayathur – Sankaneri 230kV SC line	230kV	S/C			
6	230kV DC line to proposed Muppandal 230kV SS.	230kV	D/C			

Implementing Agency	:	TANTRANSCO

S.No : TN-04

Name of RE Project	:	**Kamuthi Solar Park**

State	:	**Tamil Nadu**	Type	:	Solar
			Owner of RE Project	:	M/S Adani
Location	:	Ramnad District od Tamil Nadu			

CoD	:	by 2016	**Capacity**	:	**1000MW** **Type:Solar**
Beneficiaries	:	TANTRANSCO , M/S ADANI			

	Name of the Developers	Location	MW	Voltage (kV)
1	M/S Adani Green Energy (Tamil Nadu) Ltd. – Phase-1 (AGETL)	Kamuthi Taluk, Ramnad District	216	230
2	M/S. Kamuthi Solar Power Ltd.(KSPL)	Kamuthi Taluk, Ramnad District	216	230
3	M/S Ramnad Solar Power Ltd., (RSPL)	Kamuthi Taluk, Ramnad District	72	110
4	M/S Kamuthi Renewable Energy Ltd.(KREL)	Kamuthi Taluk, Ramnad District	72	110
5	M/S. Ramnad Renewable Energy Ltd. (RREL)	Kamuthi Taluk, Ramnad District	72	110

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Substation at Kamuthi					
	i) ICT	400/230 kV	2 Trf		2x315	
	ii) ICT	400/110 kV	3 Trf		3x200	
2	DC Quad Moose feeder from Kamuthi to Karaikudi(PGCIL) 400kV SS	400kV	QMDC			
3	230kV DC line to the existing Kavanoor 230 kV SS	230kV	D/C			
4	230kV DC line to the upcoming Tiruchuli 230 kV SS	230kV	D/C			
5	110kV DC line to the existing Kamudhi 110 kV SS	110	D/C			
3	Bus reactor at Kamuthi 400/230-110kV S/S (TANTRANSCO)	400kV	Reactor			2x80 MVAr

Implementing Agency	:	M/S Adani

S.No : KER-01

Name of RE Project	**:**	**Kottathara**

State	:	**Kerala**	Owner of RE Project	:
Location	:	**Kottathara and Nallasinga of Attapady region, Kerela**		

CoD	:		**Capacity**	**82 MW Type: Wind** wind generation potential of around 200MW wind generation of 18MW is being evacuated through the sub-transmission system
Beneficiaries	:	Kerala		

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Transformers	220/33kV	2 Trf		2x100	
2	Line bays	220kV & 110kV	Line bays			2 nos of 220kV & 4 nos of 110kV each
3	220kV line at Vettathur.	220kV	D/C			

Implementing Agency	:	KSEBL

S.No : KER-02

Name of RE Project	**:**	**Vettathur Project**

State	:	**Kerala**	Owner of RE Project	:
Location	:	**Vettathur, Palakkad Dt.**		

CoD	:		**Capacity**	**: 80 MW Type: Wind**
Beneficiaries	:	Kerala		

Transmission System for Integration of the RE Project:

Sl.	Line/ Sub-station	Voltage	Type	Length,	MVA	Remarks

No.			(S/C, D/C, or no. of Trf)	km		
1	Transformers	220/110kV	Trf		2x100	
2	Line bays	220kV & 110kV	Line bays			2 nos of 220kV & 4 nos of 110kV each
3	LILO of existing 220kV Madakathara – Areekode feeder.	220kV	D/C			

Implementing Agency	:	KSEBL

S.No : KER-03

Name of RE Project	**:**	**Kuyilimala Wind Project**

State	:	**Kerala**	Type	:	Wind
			Owner of RE Project	:	
Location	:	**Kuyilimala, Idukki Dt**			

CoD	:	**Capacity**	**wind generation of 14.25MW at Ramakkalmedu**	**Type:Wind**
			200MW is expected from the area in addition to Solar and Small Hydro Electric Projects.	
Beneficiaries	:	Kerala		

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Transformers	220/110kV	Trf		2x100	
2	Line bays	220kV	Line bays			2 nos
3	LILO of 220kV Pallivasal – Idukki feeder.	220kV	D/C			

Implementing Agency	:	KSEBL

S.No : KER-04

Name of RE Project	**:**	**Kasarhgode Solar Project**

State	:	**Kerala**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Paivalika, meenja,Kiaanoor,Kraidalam In disst Kasargode**			

CoD	:	**Capacity**	**Solar generation of 200 MW at Paivalika, meenja,Kiaanoor,Kraidalam In disst Kasargode**
			300MW is expected from other area in kasargode disst.
Beneficiaries	:	Kerala	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	400/220kV Substaion at Mylatti	440/220			3x500	
2	Line from Mylatti to Wayanad	400kV	D/C			

Implementing Agency	:	KSEBL

12.6 ATS FOR RES IN EASTERN REGION

ATS for following RES generation projects in Eastern Region have been provided:

S.No : ODI-01

Name of RE Project	**:**	**Solar Project at Odisha**

State	:	**Odisha**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Distt Balasore,Keonjhor,Deogarh,Boudh,Kalahandi & Angul**			

COD :	Capacity : 1000 MW
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	220/132 Pooling Staion each at Distt Balasore,Keonjhor,Deogarh,Boudh,Kalahandi & Angul	220/132			2x160	
2	Line Balasore Pooling station to Balasore	220	D/c			
3	Line Konjhor Pooling station to Joda	220	D/c			
4	Line from Deogarh Pooling station to Barkote	220	D/c			
5	Line from Angul Pooling station to Meramundali	220	D/c			
6	Line From Boudh Pooling station to Bolangir	220	D/c			
7	Line From Kalahandi Pooling station to Therubali	220	D/c			

Implementing Agency	:	JVC of GEDCOI & SECI

S.No : WB-01

Name of RE Project	:	**Bankura Solar Project**

State	:	**West Bengal**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**East Mednipur,West Mednipur,Bankura**			

COD :	Capacity : 500 MW (East & West Mednipur 170MW each, Bankura 160MW)
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	220/132kV pooling station each at Bankura, East & West Mednipur	220/132			2x100	Transmission scheme is Proposed for the Evacuation of power from the solar Park in East & West Mednipur and Bankura.
2	Line from Bankura to New Bishnupur	220kV	D/C			
3	Line from East Mednipur to Kharagpur	220kV	D/C			
4	Line from West Mednipur to Khargpur	220kV	D/C			

Implementing Agency	:	West Bengal State Electricity Distribution Company Ltd.

12.7 ATS FOR RES IN NORTH_EASTERN REGION

ATS for following RES generation projects in North-eastern Region have been provided:

S.No : ARP-01

Name of RE Project	:	**Tezu Solar Project**

State	:	**Arunachal Pradesh**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Tezu Township in Lohit**			

District

COD :	Capacity : 100 MW
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Pasighat- Roing-Tezu- Namsai 132kV D/C line on DC tower,	132kV	D/C			second circuit of this line could be strung for effective evacuation of power from Tezu project
2	132/33kV Pooling Station at Tezu Pool	132/33			2x50	
3	Line from Tezu Pool to Tezu	132	D/C			

Implementing Agency	:	Arunachal Pradesh Energy Development Agency(APEDA)

S.No : ASS-01

Name of RE Project	:	**Sibsagar Solar Project**

State	:	**Assam**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Amguri in Sibsagar**			

COD :	Capacity : 69 MW
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks

1	Line from Amguri to Mariani	132kV	D/C			
2	Establishment of pooling station at Amguri	132/33kV			2x50	

Implementing Agency	:	JVC of APDCL,APGCL& SECI

S.No : MEG-01

Name of RE Project	:	**Jaintia Solar Project**

State	:	**Meghalaya**	Type	:	Solar
			Owner of RE Project	:	
Location	:	**Thamar, disst West Jaintia Hill & Suchen Distt East Jaintia hills**			

COD :	Capacity : 20 MW
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
1	Establishment of 33kV Pooling station at Thamar & Suchen	33kV				
2	Line between Thamar-Myntdu Leshka HEP line	33kV		30km		
3	Line between Suchen-Myntdu Leshka HEP line	33kV		10km		
4	132kv Myntdu-Leshka HEP	132kV		20km		
5	33/132kV transformet at myntdu Leshka HEP	33/132				

Implementing Agency	:	Meghalaya Power Generation Limited

S.No : NAG-01

Name of RE Project	**:**	**Dimapur, Kohima Solar Project (** Jalukie, Distt. Peren (30MW), Ganesh Nagar, Distt. Dimapur (20MW) & Zhadima, Distt. Kohima (10MW))

State	:		Type	:	Solar
			Owner of RE Project	:	
Location	:	**Dimapur, Kohima and New Paren District**			

COD :	Capacity : 60 MW
Beneficiaries :	

Transmission System for Integration of the RE Project:

Sl. No.	Line/ Sub-station	Voltage	Type (S/C, D/C, or no. of Trf)	Length, km	MVA	Remarks
Proposed Transmission system for jaluki Solar Park (30MW)						
1	33 kV Jalukie solar park – Jalukie 2xD/c interconnection at 33kV level	33kV	2XD/C			
2	Charging of Peren – Jaluki – Dimapur line at 132kV level	132kV				
3.	Establishment of 33kV Pooling station At Jalukie Solar Park	33kV				
Proposed Transmission system for Ganeshnagar Solar Park (20MW)						
1	33KV Ganesh Nagar solar park – Ganesh Nagar D/c interconnection at 33kV.	33kV	D/C			

2	Establishment of 33kV Pooling station At Ganeshnagar Solar Park	33kV				
Proposed Transmission system for Zhadima Solar Park (20MW)						
1	LILO of 33kV Kohima- Zhadima line at Zhadima solar park at 33kV.	33kV				
2	Establishment of 33kV Pooling station At Zhadima Solar Park	33kV				

Implementing Agency	:	Directorate of New & Renewable Energy Nagaland

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